DOCUMENT RESUME

ED 234 173 CE 036 847

AUTHOR	Stehling, Al
TITLE	Feasibility Study and Development of a Program to Train Visually Impaired Students in Computer Programming. Final Report.
INSTITUTION	San Antonio Coll., Tex.
SPONS AGENCY	Texas Education Agency, Austin. Dept. of Occupational Education and Technology.
PUB DATE	[79]
NOTE	191p.
PUB TYPE	Reports - Descriptive (141) -- Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Admission Criteria; Community Colleges; *Curriculum Development; Employment Opportunities; Feasibility Studies; Postsecondary Education; *Program Development; Programers; *Programing; Surveys; Technical Education; Two Year Colleges; *Visual Impairments

ABSTRACT

A two-phase study investigated the employment opportunities for visually impaired computer programers and the practicality of training them at a community/junior college. Activities during phase 1 included an employer survey to determine employment opportunities, a department chairperson survey, a blind programer survey, development of profiles and task analysis, request for literature pertaining to the training of blind programers from training centers, gathering of literature on special training devices, and compilation of estimated costs and building requirements. During phase 2, a program to train visually impaired computer programers was developed. A list of subjects to be taught was developed, and a 21-month curriculum was designed. Recommendations were also made regarding entry-level criteria, special devices and equipment, personnel, building space requirements, special training for instructional personnel, special services for visually impaired students, job placement, and public relations. (Appendixes, amounting to well over one-half of the report, include instruments, a profile of a programer, data processing subject objectives, curriculum and catalog descriptions, entry-level criteria, a list of special devices and equipment, and two quarterly reports.) (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED234173

FINAL REPORT
FEASIBILITY STUDY
AND
DEVELOPMENT OF A PROGRAM TO TRAIN
VISUALLY IMPAIRED STUDENTS
IN
COMPUTER PROGRAMMING

DEVELOPED IN COOPERATION WITH THE
RESEARCH COORDINATING UNIT
DEPARTMENT OF OCCUPATIONAL EDUCATION AND TECHNOLOGY
TEXAS EDUCATION AGENCY
RAY BARBER, DIRECTOR
EXEMPLARY AND INNOVATIVE PROGRAMS

AND

SAN ANTONIO COLLEGE, SAN ANTONIO, TEXAS
BY
AL STEHLING, CDP
CHAIRMAN, DATA PROCESSING DEPARTMENT
SAN ANTONIO COLLEGE

CE 036 847

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

COVER BY ART MERAS

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

D Bristow

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CONTENTS

	PAGE
INTRODUCTION	1
OBJECTIVES	4
PROJECT PROCEDURES	6
PHASE I:	
Steering Committee	8
Employer's Survey	9
DPMA Survey	23
Chairpersons Survey	23
Blind Programmers Survey	24
Resource People and Organizations	33
Profiles and Task Analysis	33
Training Centers for Blind Programmers	34
Prospective Students	36
Training Devices	37
Estimated Costs	37
Building Requirements	39
Phase I Recommendations	39
PHASE II:	
Advisory Committee	41
Subjects to be Taught	42

PHASE II (continued):

Curriculum 43

Consecutive Training 47

Entry Level Standards 48

Special Devices and Equipment 49

Personnel 50

Building Space Requirements 52

Special Training for Instructional Personnel 53

Special Services for Visually Impaired Students 54

Job Placement 54

Public Relations 55

Potential Utilization of Results of Study 55

Pilot Program 57

CONCLUSIONS 59

ATTACHMENTS:

A. Programming: A "Natural" field for the Blind

B. Employers Questionnaire

C. DPMA Survey Form

D. Department Chairpersons Questionnaire

E. Blind Programmers Questionnaire

F. Resource People and Organizations

G. Profile of a Programmer

H. Common Tasks Performed by Air Force Programmers

ATTACHMENTS (continued):

I. Data Collection Form

J. First Quarterly Report

K. Data Processing Subject Objectives

L. Curriculum and Catalog Descriptions

M. Entry Level Criteria

N. Special Devices and Equipment

O. Newspaper Articles

P. Second Quarterly Report

DEFINITION OF TERMS

The following terms are defined for their usage in this report:

Advisory Committee -- An active Phase II committee established to develop the program to train visually impaired computer programmers.

Optacon -- (OPtical to TActile CONverter) converts the image of a printed letter (from paper or a CRT unit) into a vibrating tactile form that a blind person can feel with one finger.

Braille Terminal -- An on-line computer terminal which provides braille II coding as output and a keyboard for input.

CRT -- (Cathode Ray Tube) an on-line computer terminal containing a key board and a screen on which information is displayed.

Employers -- Data processing managers and supervisors who are responsible for the employment selection and the performance of the company's computer programmers.

Steering Committee -- A committee established early in the project to help identify resource people and materials, to provide direction in the Phase I data collection activities, to evaluate the data collected during Phase I, and to make recommendations at the conclusion of Phase I.

TSCB -- Texas State Commission of the Blind

Visually Impaired -- Describes the citizens who are blind, legally blind, or have a vision impairment.

Visual-Tek -- A special device that displays printed materials on a screen in a magnified form.

INTRODUCTION

In the Fall of 1977, several persons contacted the Director of Technical Education and the Chairman of the Data Processing Department at San Antonio College to encourage the college to provide training for blind/visually impaired computer programmers. Among the people to visit the campus to request specialized training for visually impaired were: Walter Musler, the director of the district's piano tuning program for the visually impaired; Bob Wiley, a blind computer programmer, and several representatives from the Governor's Coordinating Office for the Visually Handicapped. A primary concern expressed by the visitors was that the visually handicapped Texans were not reaping the benefits from the many good vocational programs offered by the public Texas Junior/Community Colleges. It appeared that many intelligent blind citizens were being routed into workshops or programs along with the low-ability and multi-handicapped blind, and were not receiving the opportunity to reach their potential. Additional observations made by the visitors were that some "gifted" or intelligent blind were sent out of state for specialized training (such as computer programming), and that others preferred to remain on welfare rolls rather than work in a position that was degrading to their educational and/or social background.

The visitors were familiar with the success of certain blind/visually impaired computer programmers, and reasoned that since San Antonio College provided the largest and most recognized business

data processing program in Texas, it would be the logical campus to provide computer programming training for the blind/visually impaired Texans.

As follow-up to the visitors request for specialized training, the department chairman made inquiries and read articles pertaining to blind programmers. Several articles reported the success of blind programmers. One of these was an article in Computerworld stating that programming was a "natural" field for the visually impaired. The article pointed out that the blind, because of their handicap, are trained to organize and systematize every aspect of their lives. This very orderly and systematic procedure is similar to the logical procedures followed by good computer programmers (Attachment A).

Other things that indicated that San Antonio College should consider training blind programmers was the success of two local blind programmers (both trained in Cincinnati, Ohio) and the Data Processing Department's success with the visually handicapped. However, there were too many unknown variables to make possible an immediate decision pertaining to the specialized training being requested. Some of the unanswered questions related to the employment opportunities; specialized training, equipment, and devices required; curriculum to be offered; mainstreamed versus segregated instruction; number of blind/visually impaired to be served; program costs; counseling, tutoring, and placement problems; etc.

In summary, the request to train the intelligent blind/visually

impaired to become computer programmers appeared to be justified, but the college was not prepared to commit itself without making a study. Permission was given to the chairman of the Data Processing Department to apply for state funds to make a feasibility study, and, if the results of that study were positive, to design a program to train blind/visually impaired programmers.

OBJECTIVES

The project was divided into two phases and each phase had a special set of objectives. The two-phase concept allowed for a logical check point where the study could be terminated in event the steering committee concluded that (1) employment opportunities did not exist, and/or (2) it was not considered practical for a junior college to offer the required training.

The established objectives were:

Phase I:

To conduct a feasibility study to determine:

1. The employment opportunities for visually impaired computer programmers
2. The type of training required (including curriculum content, special equipment and training devices, mainstreamed versus individualized instruction, etc.)
3. Whether San Antonio College should provide the required training.

Phase II:

To develop a program (AAS or Certificate of Completion) to train visually impaired computer programmers. The program package will:

1. List the proposed curriculum
2. Identify the length of the program, the mainstreamed

and segregated courses; and any special training equipment and devices needed

3. Identify the special faculty, counseling, tutoring, and job placement needs to serve the visually impaired students.

The goal was to implement the program developed during Phase II at San Antonio College when State or Federal funds became available to support the specialized training. The proposed target date to offer the program was the Fall Semester of 1979.

PROJECT PROCEDURES

Listed below are the project procedures as they appeared in the application for TEA funding for exemplary and innovative programs. Some deviations were made to stated procedures and they are identified in the following sections (Phase I and Phase II). The proposed procedures were:

> Phase I, scheduled for three months (7-1-78 thru 9-30-78), will start with a steering committee seminar. This steering committee will include members of the Data Processing Department's Advisory Committee, blind programmers in the San Antonio area, representative(s) from the Governor's Coordinating Office for the Visually Handicapped, TEA representative(s), San Antonio College administrator(s), and the project coordinator. The purpose of the seminar will be to identify resource people and materials, and to determine which data gathering tools should be employed during the feasibility study. Next, selected local and state computer installations will be surveyed to determine (a) the employment opportunities for visually impaired computer programmers, and (b) the specific training which needs to be included in the program. While this information is being gathered, the project coordinator will visit segregated training centers for blind programmers in the northern and western states, computer manufacturers, consultants, and blind programmers to become familiar with the procedures and problems dealing with the training of visually impaired students. In addition to gathering data pertaining to the educational process, statistics dealing with the teacher/student ratio, tutoring and counseling services, instructional techniques, cost per student, length of instruction, special teaching aids, etc., will be accumulated.
>
> The project coordinator will prepare a summary of the employment opportunities, the training requirements, estimated costs, anticipated problems and possible solutions, etc. A second seminar will be scheduled so that the results of the feasibility study can be reviewed and analyzed by the steering committee. The purpose of this seminar will be to determine whether the need to train visually handicapped computer programmers exists, and if so, whether San Antonio College

should provide this training.

If the seminar participants reach a negative decision, the project will terminate. In the event the decision is positive, the project will move into Phase II.

During Phase II, the project coordinator will develop the program. Additional input will be requested from the persons who attended the seminars and the resource people. Travel will be necessary to gather more detailed information, particularly in the area of mainstreaming techniques and special assistance for the visually handicapped students. Phase II is scheduled for four months (10-1-78 thru 1-31-79). An advisory committee of successful blind and sighted programmers will assist the project coordinator in the development of the proposed program.

PHASE I

STEERING COMMITTEE:

The steering committee was established and consisted of the following members:

1. Dr. Robert Bottenberg (blind)
   Chief Computational Sciences Division
   Air Force Human Resources Laboratory
   Brooks Air Force Base

2. O. C. "Bud" Davidson (visually impaired)
   Deputy Director of Individual Assistance Services
   Governor's Coordinating Office for the Visually Handicapped
   Austin, Texas

3. Robert M. Hackett (employer and member of D.P. Advisory Committee)
   Director, Application Services
   City Water Board
   San Antonio, Texas

4. Sharon Lynn Hill (counselor)
   Counselor/Coordinator for Handicapped Students
   San Antonio College

5. Dr. Max Jabs (administrator)
   Associate Dean of Instruction
   San Antonio College

6. Patricia F. Lindey (educational agency)
   Coordinator, Vocational Curriculum
   Texas Education Agency
   Austin, Texas

7. Edward Marquart (blind, retired)
   Computer Programming Instructor
   San Antonio, Texas

8. Walter Musler (legally blind)
   Program Director, Piano Tuning
   San Antonio College

9. Chester Neeley (blind programmer)
Automation Officer, Systems Research
Frost National Bank
San Antonio, Texas

10. Charles Raeke (blind)
Supervisor of Program Evaluation
Planning and Development
Texas State Commission of the Blind
Austin, Texas

11. Frank Sievers (employer and member of D. P. Advisory Committee)
Vice-President
Frost National Bank
San Antonio, Texas

12. Al Stehling (project coordinator)
Chairman, Data Processing
San Antonio College

13. Bob Wiley (blind programmer)
Programmer and System Analyst
City Water Board
San Antonio, Texas

Other persons invited to committee meetings were:

1. Ray Barber
Director Exemplary and Innovative Programs
Texas Education Agency
Austin, Texas

2. Nellie Thorogood
Director Occupational Education and Technology
San Antonio College

EMPLOYERS SURVEY:

During the first steering committee meeting, Charles Raeke reported that experiences in his office (TSCB) indicated that generally only 15% of the population responded to mail-out questionnaires pertaining to the blind. The committee agreed that a 15% response would

not provide valid results to determine the employment opportunities for visually impaired. The steering committee concluded that the employment opportunity data could best be gathered by personal interviews during which the project coordinator would complete a standardized questionnaire. The employers' population was defined as approximately fifty computer installations in San Antonio, and five each in Houston, Dallas, and Austin. The samples from Houston, Dallas, and Austin were used to validate the survey of the San Antonio employers.

Gathering employment information from employers instead of mailing out questionnaires was a major change in the proposed procedures. The project coordinator spent a great deal of time making appointments, waiting in employers' offices, and completing the questionnaires during the interviews. A three-day trip was made to gather employment opportunity data from employers in Houston, Dallas, and Austin. Forty-eight employers were interviewed in San Antonio, five in Houston, six in Dallas (one refused to answer the questions), and five in Austin.

The steering committee had proposed that employment opportunity data be gathered only from the medium to large size computer installations because many of the small shops employ operator/programmers instead of programmers. In addition, the programming tasks may be performed by the data processing manager in the small shops. Thirteen of the 64 installations contacted identified themselves as

"small" (an annual D.P. budget of less than $250,000), although they employed several programmers. The results of their input is included in the survey because they were not "small one-person shops."

The employers questionnaire appears in Attachment B and the summarized results are listed below (SA represents San Antonio, and H D A represents Houston, Dallas, and Austin):

Section One:

1. Size of installation based on D.P. budget:

	SA	H D A	TOTAL
Small (less than $250K)	12 (25%)	1 (7%)	13 (21%)
Medium ($250K - $1,000K)	22 (46%)	4 (26%)	26 (41%)
Large (Over $1,000K)	14 (29%)	10 (67%)	24 (38%)
TOTALS	48	15	63

2. Primary computer System in use:

MANUFACTURER	SYSTEM	SA	HDA	TOTAL
IBM	370s/155,158,168	7	6	13
AMDAHL	470		1	1
ITEL	470		1	1
Burroughs	6807,6811	1	1	2
AMDAHL	V-6		1	1
IBM	370s/145,148	4	1	5
Burroughs	3700,3800,4800	3		3
IBM	370s/125,138	5		5
Honeywell	6200	1		1
Datapoint	6600	1		1
NCR	Criterion 8570	1		1
IBM	360s	7	2	9
Honeywell	2015	1		1
NCR	Century 200,201,300	3		3
Burroughs	2800	1		1
Univac	9030	1		1
IBM	S/3	2		2
Burroughs	1700,1728	3		3
NCR	100,151	3		3
Datapoint	5500	3		3
Univac	1110	1		1
ITEL	84		1	1
Service work performed on many different systems			1	1
	TOTALS	48	15	63

3. Two most commonly used languages and estimated percentage of total programming effort:

Language		# USERS	Percentage of Total Effort 90-100	80-89	70-79	60-69	50-59	40-49	30-39	20-29	10-19	0-9
COBOL	SA	40	16	5	2		6	3		3	3	2
	HDA	13	5	1	2	1	3				1	
Assembly	SA	15	1		1	1	1	1		2	1	7
	HDA	9		1			1		1	1	1	4
RPG II	SA	15	4	1		1	4	1		2	1	1
Neat/3	SA	6	4	1						1		
Data-share	SA	4	1	2			1					
PL/1	SA	3					1	1			1	
	HDA	2		1							1	
FORTRAN	SA	3									2	1
	HDA	4							1	3		
BASIC	SA	2									1	1
SYDOL	HDA	1						1				
CICS	SA	1							1			
Mark 4	HDA	1										1
Easy Coder	SA	1										1
MOBOL	SA	1										1

4. Type of formal in-service training for programmers:

	SA	HDA	TOTAL
Comprehensive	2(4%)	3(20%)	5(8%)
Limited	13(27%)	6(40%)	19(30%)
None	33(69%)	6(40%)	39(62%)
TOTALS	48	15	63

5. Are newly-employed programmers required to take in-service training?

Yes	9(18%)	4(26%)	13(21%)
Depends on previous experience	5(10%)	1(7%)	6(10%)
Depends on previous schooling	1(2%)	0	1(1%)
Depends on combination of things	1(2%)	4(27%)	5(8%)
No formal in-service training	32(68%)	6(40%)	38(60%)
TOTALS	48	15	63

6. Use of programming teams:

All programmers work in teams	9(19%)	2(13%)	11(17%)
Most programmers work in teams	8(17%)	7(48%)	15(24%)
Some programmers work in teams	16(33%)	4(26%)	20(32%)
Programming teams are not used	15(31%)	2(13%)	17(27%)
TOTALS	48	15	63

7. Employment of handicapped programmers:

Have employed visually handicapped programmers	7(15%)	2(13%)	9(14%)
Have employed other handicapped programmers	6(12%)	6(40%)	12(19%)

	SA	HDA	TOTAL
Have not employed handicapped programmers	37(77%)	8(53%)	45 (71%)

Note: Totals do not balance because several employers have hired visually and other handicapped programmers

8. Applications from handicapped programmers:

Have received applications from visually handicapped programmers	4(8%)	3(20%)	7(11%)
Have received applications from other handicapped programmers	7(15%)	5(33%)	12(19%)
Have not received applications from handicapped programmers	38(79%)	7(47%)	45(71%)

Note: Totals do not balance because one employer received applications from both visually and other handicapped programmers

9. Classification and number of programmers:

	1978			1983(Est.)			% Increase		
	SA	HDA	TOTAL	SA	HDA	TOTAL	SA	HDA	TOTAL
Classification									
Business Application	272	375	647	501	851	1352	84%	127%	109%
Scientific Application	8	53	61	15	88	103	88%	66%	69%
Programmer/ Systems Analyst	253	250	503	328	476	804	30%	90%	60%
System Programmer	96	63	159	178	152	330	85%	141%	108%
Others	191	18	209	454	28	482	138%	56%	131%
TOTALS	820	759	1579	1476	1595	3071	80%	110%	94%

Note: Several employers stated that their companies are planning to assign programming tasks to the user areas, thereby reducing the number of programmers under the supervision of the Data Processing Departments.

Section Two:

1. I would consider employing a visually handicapped programmer	SA	HDA	TOTAL
DY (Definitely yes)	5(10%)	5(33%)	10(16%)
PY (Probably yes)	23(48%)	5(33%)	28(44%)
U (Undecided, unknown)	10(21%)	3(20%)	13(21%)
PN (Probably not)	10(21%)	2(14%)	12(19%)
DN (Definitely not)	0	0	0

2. I would consider employing a visually handicapped programmer if I had the opportunity to work with the student during an internship program.			
DY	8(17%)	3(20%)	11(17%)
PY	19(40%)	6(40%)	25(40%)
U	11(22%)	5(33%)	16(26%)
PN	10(21%)	1(7%)	11(17%)
DN	0	0	0

3. Top management encourages me to hire visually handicapped employees.			
DY	4(8%)	1(7%)	5(8%)
PY	7(15%)	0	7(11%)
U	32(67%)	13(86%)	45(71%)
PN	4(8%)	1(7%)	5(8%)
DN	1(2%)	0	1(2%)

	SA	HDA	TOTAL
4. All qualifications being equal, I would probably offer a vacant programming position to a visually handicapped applicant.			
DY	4(8%)	0	4(6%)
PY	10(21%)	7(47%)	17(27%)
U	15(31%)	0	15(24%)
PN	19(40%)	7(47%)	26(41%)
DN	0	1(6%)	1(2%)
5. I would be willing to install a special device or terminal to assist the visually handicapped programmer.			
DY	7(15%)	0	7(11%)
PY	17(35%)	9(60%)	26(41%)
U	14(29%)	3(20%)	17(27%)
PN	10(21%)	2(14%)	12(19%)
DN	0	1(6%)	1(2%)
6. My primary hesitation (if any) to employing a visually handicapped programmer deals with our physical facilities.			
DY	17(35%)	4(26%)	21(33%)
PY	6(13%)	4(26%)	10(16%)
U	3(6%)	0	3(5%)
PN	7(15%)	2(14%)	9(14%)
DN	15(31%)	5(34%)	20(32%)

		SA	HDA	TOTAL
7.	My primary hesitation (if any) to employing a visually handicapped programmer deals with attitudes and emotions.			
DY		1(2%)	0	1(2%)
PY		7(15%)	2(14%)	9(14%)
U		2(4%)	1(7%)	3(5%)
PN		12(25%)	4(26%)	16(25%)
DN		26(54%)	8(53%)	34(54%)
8.	I would be more inclined to employ a visually handicapped programmer if I had input to the training curriculum.			
DY		8(17%)	0	8(13%)
PY		13(27%)	6(40%)	19(30%)
U		5(10%)	2(13%)	7(11%)
PN		14(29%)	2(13%)	16(25%)
DN		8(17%)	5(34%)	13(21%)
9.	I feel that it is possible to train visually handicapped programmers for the position(s) in our installation.			
DY		12(25%)	1(7%)	13(21%)
PY		19(40%)	7(47%)	26(41%)
U		11 (23%)	2(13%)	13(21%)
PN		5(10%)	5(33%)	10(15%)
DN		1(2%)	0	1(2%)

		SA	HDA	TOTAL
10.	We have a detailed list of tasks or duties to be performed by firm's programmers.			
DY		20(42%)	4(26%)	24(38%)
PY		6(12%)	3(20%)	9(14%)
U		1(2%)	0	1(2%)
PN		8(17%)	1(7%)	9(14%)
DN		13(27%)	7(47%)	20(32%)
	If yes, I feel that a visually handicapped programmer could satisfy the specified qualifications.			
DY		4(8%)	1(7%)	5(8%)
PY		11(23%)	4(26%)	15(24%)
U		5(10%)	1(7%)	6(10%)
PN		7(15%)	1(7%)	8(13%)
DN		0	0	0
11.	We have a written job qualification for our programming position(s).			
DY		32(67%)	10(66%)	42(67%)
PY		2(4%)	1(7%)	3(5%)
U		0	0	0
PN		1(2%)	1(7%)	2(3%)
DN		13(27%)	3(20%)	16(25%)

		SA	HDA	TOTAL
	If yes, I feel that a visually handicapped programmer can perform the specified tasks or duties.			
DY		9(19%)	3(20%)	12(19%)
PY		15(31%)	4(27%)	19(30%)
U		4(8%)	2(13%)	6(10%)
PN		5(10%)	2(13%)	7(11%)
DN		2(4%)	0	2(3%)
12.	We sometimes make "trade offs" between the required job qualifications and other accomplishments (schooling, experience, etc.) when employing programmers.			
DY		40(83%)	11(73%)	51(81%)
PY		7(15%)	3(20%)	10(16%)
U		0	0	0
PN		1(2%)	1(7%)	2(3%)
DN		0	0	0

13. Duties performed by programmers that employers felt could not be performed by a visually handicapped programmer were:

Number		Comments:
SA	HDA	
5	1	Coding (use coding sheets).
12	5	Read program listings and "dumps".
17	2	Read materials (hard copy, instructions, back up procedures, labels, research materials, forms, reports, manuals, microfilm, specifications, test runs, etc.).

Number		Comments:
SA	HDA	
4	1	Key punching, data entry operations.
16	2	Program debugging, testing, maintenance, and modifications.
12	1	Back-up computer operations, computer operations, access to hardware, work with operator to debug programs, compiling.
1	0	Create JCL instructions.
14	12	On-line programming (use of CRT units, on-line coding, on-line testing, on-line verification, CRT program maintenance).
1		Locating logic errors.
8	1	Interface with users, presentations before groups, black board layouts, meet with users at odd locations, lack of mobility, visit out-of-town users, visit clients.
3	1	Work at night and week-ends.
6	6	Write documentations and specifications, draw layouts and flowcharts.
4	0	Balance test runs, sight verification, interface with other programmers' paperwork, interface with "memo" environment.
1	1	Install software packages, work with software.
4	1	Conduct interviews, self-training, supervision, function independently, system analysis.

14. Comments by (1) employers who would not consider hiring a visually impaired programmer, (2) employers who felt that the visually impaired programmers could not be trained to work in their installations, (3) employers who felt that visually im-

paired programmers could not performed specified tasks, or (4) employers who felt that visually impaired programmers could not meet their job qualifications were:

Number		Comments:
SA	HDA	
5	6	Do not have and/or cannot afford special devices and other arrangements needs to accommodate blind programmers.
4	2	Do not understand blind programmers needs and abilities.
3	0	Programmers are required to operate hardware.
4	0	No back-up, no time to work with handicapped, cannot afford extra costs.
4	2	All things being equal, a sighted programmer would be more productive.
1	0	Several visually handicapped should be employed to justify added costs.
3	1	Programmers are required to work in the evenings. Blind cannot function independently, move out-of-town, visit customers.
2	1	Blind cannot handle source documents, printed information, reading assignments, and emergency procedures.
1	0	Most programming tasks deal with maintenance.
1	0	"Hard Pressed" to train personnel.
1	0	Blind programmers cost more than they produce.
0	1	Programmers must work with a large variety of software.
0	1	Programmers are required to take written aptitude tests.

DPMA SURVEY:

One of the steering committee members suggested that a short employment opportunity questionnaire be mailed to the presidents of the Texas Data Processing Management Association Chapters. Seventeen mini-surveys were mailed (see Attachment C) and seven presidents responded. Four of the seven mini-surveys were not filled out properly, and the others appeared to have a "follow the leader" type of response. The employment opportunity data gathered though this particular survey was not considered valid.

DEPARTMENT CHAIRPERSONS SURVEY:

Since non-data processing classes were to appear on the curriculum, a short questionnaire (see Attachment D) was sent to eight department chairpersons whose courses were likely to appear in the curriculum. The eight chairpersons included the Director of Learning Resources and the Chairman of the Orientation Program. Seven replies were received and were summarized as follows:

	Yes	Undecided	No
1. Blind and visually impaired students can be "mainstreamed" into the classes taught by our department.	6		1
2. Our department would be able to schedule special class sections to offer segregated instruction for the blind and visually impaired students.	2		5

	Yes	Undecided	No
3. Our department would be able to provide small classes (6 to 8 students), if necessary to serve blind and visually impaired students.	2		5
4. Our department would be able to provide special training devices to assist the blind and visually impaired students.	4	1	2
5. Arrangements could be made in our department to provide tutoring and other special services to insure that the blind and visually impaired can reach our course objectives.	4		3
6. Our department could provide courses that would meet longer than the normal class periods so the training could be completed before the end of the scheduled semester.	2	1	2
7. Our department could provide a faculty member who would serve as a liaison for the planning and instructional phases in the training of blind and visually impaired students.	6		1

BLIND PROGRAMMERS SURVEY:

The steering committee members agreed that data pertaining to the training requirements should be gathered from (1) visually impaired programmers and (2) schools that are currently training

visually impaired programmers. A lengthy questionnaire was prepared to gather data from visually impaired programmers. However, it proved difficult to obtain names and current addresses of visually impaired programmers, and only eighteen questionnaires were mailed. Of these, eight programmers completed the questionnaires, two replied that they were not blind, one replied that he was not a programmer, and one letter was returned as "no such street number."

Attachment E contains the cover letter and questionnaire mailed to the blind programmers. The summarized results are:

1. Age at which sight was lost:
   Birth (4), 8, 11, 15, and 33

2. Highest educational level before sight was lost:
   N/A (4), grades 2, 5, 8, and 12

3. Highest educational level after sight was lost:
   H/S, 2 years college, bachelor's (5), master's

4. Employment in data processing or related field before the loss of sight:
   None (8)

5. Primary occupation before loss of sight:
   N/A (7), crop duster pilot

6. Programming schooling at:
   On-the-job (2), trade school (4), college or university (2)

7. School or company that provided training:
   MedComp (4), New Mexico State University, University of Texas at Arlington, NASA, and EnTex, Inc.

8. Married at time of programming training:
   Yes (4), No (4)

9. Source and percentage of usage of out-of-classroom learning materials:
   Braille: 0% (3), 5%, 10% (2), & 61%
   Audio Tapes: 0% (3), 10%, 25%, 29%, 80% & 90%
   Readers: 0% (5), 10%, 15%, & 80%
   Tutors: 0% (6), 25% & 80%
   Magnifiers: 0% (7), 100%
   Own reading: 0% (6), 95% & 100%
   Fellow programmers: 0% (7) & 5%

10. Training school taught only blind students:
   Yes (4), No (4)

11. Blind students could be taught to program in schools for sighted:
   Yes (7), Unknown (1)

12. The blind should be trained to be:
   Business programmers (8), scientific programmers (7) and software programmers (6)

13. The size of programming staff in computer installation most likely to hire a blind programmer:
   0 - 5 (0), 6 - 15 (1), 16 - 30 (5), 31 - 100 (5), and over 100 (5).

14. Number of programmers at employment installation:
   22, 25 (2), 40, 50, 60, over 100, and 125

15. Work as part of a programming team at employment installation:
   Most of the time (3), sometimes (4), none of the time (1)

16. Blind programmer would be more productive if part of a programming team:
   Yes (6), no response (2)

17. Level of the blind programmer's educational level has a direct effect on employment opportunities:
   Yes (8)

   Level of education that provides best employment opportunities for blind programmers:
   One year program (2), bachelor's degree (4), master's degree (2)

18. Candidates for programming school should be screened by a panel of programmers:
Yes (3), No (3)

19. Special devices provided by employer to assist blind programmer:
LED 120 (braille terminal) (2), elastic tape for braille listings (2), flourescent lamp, telray CRT, braille writer (3), braille typewriter, and tape recorder.

20. Programming tasks performed by sighted programmer which blind programmer cannot perform:
Flowcharting (2), reading dumps (4), documentation, filing, reading inquiries, checking report output, TSO operations, working with microfiche, and CRT operations.

21. Services offered by blind programmers to "trade-off" for tasks they cannot perform:
Better checkout of programs, better attendance, better analysis and design, less distractions, excellent knowledge of programming languages (2), provide security by use of braille, better memory and recall, greater desire to prove himself, and better prepared for the unexpected.

22. The remaining statements, qualifications, and courses are rated as DI (definitely important, "must have" or "must know"); I (important, "should have" or "should know"); U (uncertain, undecided, "maybe"); NI (not important, can probably do without, "of little value"); and DU (definitely unimportant, "of no value").

STATEMENTS:	DI	I	U	NI	DU
Blind programmers must be better trained than most sighted programmers.	4	2		1	1
Internship (on-the-job training) should appear in the curriculum for blind programmers.	5	3			

	DI	I	U	NI	DU
The instructors who teach the blind programming students need special training.	3	1	3	1	
Student tutoring should be provided for the blind students.		3	2	3	
Faculty tutoring should be provided for the blind students.	1	1	3	2	1
Special counseling services should be provided for the blind students.	1	1	3	2	1
Very strict entry-level qualifications must be maintained for the blind students.	3	1	3		
Braille output of the students compile and test runs should be provided.	5	1	1		1

ENTRY LEVEL QUALIFICATIONS:	DI	I	U	NI	DU
Strong desire to be independent.	3	4	1		
Willingness and ability to relocate	1	6	1		
Good health	2	4		2	

ENTRY LEVEL QUALIFICATIONS:	DI	I	U	NI	DU
High school graduate	7	1			
Good grooming	2	6			
Good verbal communication	4	4			
Good mathematical background		3	3	3	
Proficiency in braille	2	4	1		
Mobility (independent movements, with or without a cane)	5	2	1		
IQ Above Average	1	1			
Strong desire to succeed	3				
Adaptability		1			
Work well with others	1				
Congeniality		1			
Accept help when needed	1				
Remember details	1				
Aptitude for logic	1				

Courses that should be offered:	Method		DI	I	U	NI	DU
Note: The two methods are M (mainstreamed) and S (segregated).	M	S					
Introduction to Computers	6	1	6	2			
BASIC Programming Language	2	2	1	2	3	2	
RPG II Programming (1st Semester)			3	2	3		
RPG II Programming (2nd Semester)	2	1		2	3	3	
Job Control Language	3	4	6	2			
COBOL Programming (1st Semester)	4	3	4	4			
COBOL Programming (2nd Semester)	3	2	4	3	1		
System Design (1st Semester)	5	1	3	3	1	1	
Advanced System Design (2nd Semester)	4	1	2	2	2	1	1
FORTRAN Programming	4	1	2	3	2	1	

Data Processing courses:	Method		DI	I	U	NI	DU
	M	S					
Assembly Language (1st Semester)	4	3	3	4	1		
Mini-Computers	6	0		5	3		
Data Processing Applications	7	0	5	2	1		
Programming Techniques	1	0	1				
Software & Architecture	2	0			2		
SPSS	1	0		1			
Data Base Management	1	0		2			
Structured Methodologies	3	0	3				
User Interface Practices	1	0	1				
Advanced Assembly Language	1	0	1				

Support Courses:	Method		DI	I	U	NI	DU
	M	S					
English Composition (1st Semester)	6	0	1	5		2	
English Composition (2nd Semester)	4	0		4	2	2	

Support Courses:	Method		DI	I	U	NI	DU
	M	S					
College Algebra	5	1	2	5	1		
Statistics	3	1	1	6		1	
Accounting (1st Semester)	5	1	1	5	2		
Accounting (2nd Semester)	3	1	1	3	3	1	
State Government	2	0		1		4	2
Orientation to College	2	0		1	5	2	
Numerical Analysis	1	0	1				
Trigonometry & Calculus	1	0		1			
Typing	1	0	1				
Speech & Communication	2	0	2				
Business Administration	1	0	1				
Technical Writing	2	0	1	1			

An interesting observation is that the majority of the courses were tagged as mainstreamed although two-thirds of the respondents chose to go to a segregated school for their programming training.

RESOURCE PEOPLE AND ORGANIZATIONS:

The project coordinator wrote letters (requesting input to the study) to resource people and organizations which included: professional data processing organizations, employers of blind programmers, schools that train blind programmers, schools that used to train blind programmers, Ohio State University (task analysis), resource people listed in the 1977 Technology Transfer Directory, organizations that work with the blind, authors of articles in professional journals and newspapers, the Dean of the College, the campus coordinator of the handicapped, etc. Some of the resource people and organizations did not reply, some sent referrals to other resource people, some sent short and/or futile replies, and others supplied very meaningful contributions to the study. Two observations were: (1) Phase I may have been too short to locate and receive feed-back from resource people and organizations, and (2) very few resource people expressed their experiences and/or opinions in writing.

Attachment F is a summary of the resource people and organizations contacted for input to the study. Most of the replies received from these resources were packaged materials.

PROFILES AND TASK ANALYSIS:

Early in Phase I, the steering committee members requested a "profile of a programmer." The project coordinator visited the Air Force Human Resource Laboratory at Brooks Air Force Base to review literature pertaining to the data processing job clusters

and task analysis. Profiles of a programmer (Attachment G) and copies of the common tasks performed by Air Force programmers (Attachment H) were mailed to the steering committee members. Efforts to obtain task analysis for computer programmers from Ohio State University proved fruitless.

TRAINING CENTERS FOR BLIND PROGRAMMERS:

Literature pertaining to the training of blind programmers was obtained from various training centers including:

1. System Development Corporation
   San Monica, California

2. University of Manitoba
   Winnipeg, Manitoba, Canada

3. Columbus Tech
   Columbus, Ohio

4. Computer System Institute
   Pittsburg, Pennsylvania
   (Note: They no longer train blind programmers)

5. Arkansas Enterprises for the Blind
   Little Rock, Arkansas

6. MedComp Research Foundation
   Cincinnati, Ohio

Data pertaining to the above six training centers for visually impaired computer programmers was packaged and made available to the steering committee members. In addition to the above training centers, the Pitt Technical Institute in Greenville, North Carolina responded to our request for input. Their efforts to train blind computer programmers have been unsuccessful.

The project coordinator made a two-day visit to the Arkansas Enterprises for the Blind in Little Rock, Arkansas and another two-day visit to the MedComp Research Foundation in Cincinnati, Ohio. A fourteen-page data collection form (Attachment I) was used to record the data collected while interviewing administrators, instructors, and students at the two training centers. The data collection forms were made available to the steering committee members who were interested in the detailed analysis. The project coordinator summarized key observations made during the visits to the two training centers and distributed a copy of these observations to all steering committee members. The major observations were:

1. The training centers are not schools per se.
2. Only a small number of students are enrolled in the programs. Normally only 4 to 8 programming students are enrolled at any one time.
3. Most students are "out-of-state" students who were referred to the training centers by an agency working with the blind and visually impaired.
4. Students enter the training centers at various times. It is possible that no two students are at the same stage of training at a given time.
5. Programs have a director or coordinator who works very closely with the students. The director is the only full-time instructor and he performs other computer-related duties in addition to teaching. The director receives part-time instructional assistance from programmers, blind off-premise programmers, and guest speakers.
6. Classrooms are not used. Instructors meet with students in various offices, conference rooms, data entry stations, and lab areas on a space-available basis. Most meeting locations are small and crowded.

7. Although the curriculum is described in class hours and/or class days, the students do not come in or leave at scheduled times. Programs use a self-paced, individualized instruction approach.

8. Other than internship, students are not employed while they are in the program. The better students devote most of their day to their programming studies.

9. The training is informal and unstructured. The instructor may spend hours discussing topics and techniques in which one or more student shows an interest.

10. Recorded tapes ("talking books") and braille books are available to the students. Lack of formal check-out and check-in procedures makes it difficult to locate a particular tape or braille book.

11. Few, if any, formal tests are administered. Students are graded on performance.

12. Training centers specialize in training the blind and visually impaired. Program directors are visually impaired or were selected because of their interest in working with handicapped persons.

13. Although the training centers have an impressive list of prerequisites, it appears that the entry level standards are being lowered for economical reasons.

PROSPECTIVE STUDENTS:

Short questionnaires were mailed to local and state offices for the State Commission of the Blind and to the Governor's Coordinating Office for Visually Handicapped. This questionnaire requested the estimated number of qualified blind Texans who would be likely to pursue a career in computer programming. The state office for the Commission of the Blind reported that the results of a recent survey showed that there were ten blind Texans who have a vocational goal of computer programming.

TRAINING DEVICES:

The project director accumulated literature pertaining to special training devices used by blind programmers and/or blind programming students. Devices on which material was gathered included:

1. ARTS (Audio Response Time Sharing) System
2. Optacon
3. Audible Light Detector
4. Speech Plus (talking calculator)
5. Braille Display Terminal
6. Portable Braille Terminal
7. Triformation's LED-120 Braille Terminal
8. Triformation's LED-1 Brailling Device
9. Triformation's ISE-1 Braille Embosser
10. Triformation's BD-3 Braille Computer Terminal
11. Triformation's PBCE Reproduction System

The literature pertaining to the above devices was packaged and made available to the Steering Committee members. Several committee members checked out the various packaged materials (training programs, data collection forms, devices, etc.) to study the material at home.

ESTIMATED COSTS:

In order to give the steering committee members a general idea of the estimated program costs, the project director prepared a statement of "ball-park" estimates based on his interviews with the administrators at MedComp and the Arkansas Enterprises for the Blind.

Costs figures accumulated during Phase I are listed below: (additional cost input during Phase II resulted in more realistic cost estimates).

Estimated start-up costs:

LED 120 (braille terminal)	$ 16,740
Optacon	2,900
Visual-Tek (TV system to magnify printed materials)	1,750
Two Perkins braillers	300
Six tape recorders	300
Mechanical card reader	200
Student typewriter	500
Office furniture for program director	1,000
Furniture for two small student learning rooms	1,000
TOTAL Start-up Costs	$ 24,690

Estimated Annual Costs:

Program Director	20,000
Orientation and Mobility Specialist	16,000
Student tutors	3,302
Instructor (to be shared by the data processing department)	8,000
Secretary (to be shared by another department)	2,400
Software packages	2,000
Software programming	1,000
Overhead and supplies	1,000
TOTAL Annual Costs	$ 53,702

BUILDING REQUIREMENTS:

At the end of Phase I, building (space) requirements appeared to be:

1. A small classroom for segregated classes. This room was to be used as a conference room and study area for the blind when classes were not scheduled.

2. Two small lab areas to house (a) the tape and braille library, (b) special training devices, and (c) the braille terminal.

3. An office for the program director.

Other building (and grounds) considerations included the installation of braille and "raised" room numbers, rails, buzzers at the stairwells, provisions for seeing eye dogs, etc. Street crossings (which serve as deep water run-offs when it rains) appeared to be a major mobility barrier.

PHASE I RECOMMENDATIONS:

On September 27, the steering committee met for a one-day workshop to digest the data gathered and to make its recommendations. Assisting the blind and visually impaired committee members were four readers and the data processing department's secretary. Each steering committee member was given a packet of summarized data, and packages of detailed data were issued to members on a sign-out basis. The committee was divided into small groups and (with assistance from the readers) reviewed the research material. Later in the day the committee discussed the results of the study at length.

After all committee members' questions were answered, the group: (1) agreed that there were employment opportunities for visually impaired computer programmers in Texas, (2) recommended that San Antonio College provide a program to train visually impaired programmers, and (3) recommended that the project move into Phase II. The committee felt that the type of training offered by other training centers could be matched and surpassed by San Antonio College.

Phase I concluded with a quarterly report to Ray Barber, Director of Exemplary and Innovative Programs, Texas Education Agency. A copy of this report appears in Attachment J.

PHASE II

ADVISORY COMMITTEE:

The advisory committee for Phase II consisted of:

1. Donald Douglas
   Vice-President, Data Processing
   Frost National Bank

2. John P. Merritt
   Assistant Data Processing Manager
   San Antonio Light

3. Chester Neeley, (blind)
   Automation Officer, System Research
   Frost National Bank

4. Annette Ratcliffe
   Data Processing Laboratory Technician
   San Antonio College

5. Jimmy R. Sparkman
   Programmer Analyst
   Tesoro Petroleum Corp.

6. Bob Wiley (blind)
   Programmer/Procedures Analyst
   City Water Board

7. Al Stehling (project coordinator)
   Chairman, Data Processing Department
   San Antonio College

The advisory committee met ten times and proved to be an active "working committee" from the very start. During the first meeting, the advisory committee was briefed on (a) the objectives of the total project, (b) Phase II objectives, (c) the results of the Phase I studies, and (d) data collection efforts. Materials distributed to the members included the Phase I Quarterly Progress Report, a list of proposed Phase II activities, and a comparison of the curricula

of four schools that train visually impaired programmers. In addition, advisory committee members "checked-out" packets containing detailed information about training devices and schools that train visually impaired computer programmers.

Committee members agreed that:

1. Rehabilitation training must be completed before the students qualify for computer programming training.

2. The curriculum must be flexible in the sense that the program director can alter the curriculum to suit the employment opportunities for a particular student.

3. An associate degree program would offer the best employment opportunities.

4. The students should be offered more advanced programming techniques and studies, but in fewer areas (as compared to the current AAS programs in computer programming).

5. The program would be designed for employability, not transferability.

SUBJECTS TO BE TAUGHT:

Beginning with the very first meeting, the committee members developed a list of "subjects" (data processing and support subjects) to be included in the program. Each proposed subject was justified by one or more members and discussed in detail. During the next weeks, subject areas were modified, added, and in some cases, deleted or combined. Objectives were written for every data processing subject. These objectives were also discussed in great detail and most subject objectives were re-written three or four times.

Subjects were then translated into courses. Some subjects can be taught as one course, other subjects will have to be covered in two courses (example: the COBOL programming subject objectives are reached after the student completes the second COBOL course). Attachment K contains the data processing subject objectives.

Committee members reviewed existing course syllabuses to determine which existing courses (offered by the data processing and supporting departments) would fulfill the stated subject objectives. A memo was sent to those departments that offered the required support courses to double-check the departments' willingness to mainstream the visually impaired students into their classes. Only one department indicated that it could not accommodate blind students. The committee found a similar course offered by another department and modified the curriculum accordingly.

CURRICULUM:

A 16-month curriculum was prepared and studied. As the subject objectives were strengthened, the curriculum was redesigned and extended to a 21-month program. Courses in the program were classified as segregated and mainstreamed, and an estimated number of weekly home-work hours was assigned to every course.

For the purpose of this project, mainstreamed means that the visually impaired students will register for a course along with sighted students. Segregated classes are special classes for the

visually impaired students. Sighted students may register for segregated classes, but only after they are fully aware that (1) the class presentations are geared towards unsighted students and (2) that traditional training aids will not be utilized. In addition, the committee agreed that in some cases, courses identified as main-streamed could be segregated--if the number of visually impaired students justified a separate class.

Catalog descriptions were developed for the "new" data processing courses (courses that are not currently listed in the college catalog) and forwarded to the Dean's office for presentation to the college's Academic Council. The new data processing courses were approved and will appear in the 1979-80 San Antonio College catalog. Modifications to the proposed curriculum were continuous as the program was streamlined. Subject objectives, course titles, course descriptions, and course numbers were changed as committee members proposed modifications to strengthen the program.

The curriculum (Attachment L) is designed to produce COBOL programmers with a solid foundation in JCL and Assembly Language. The student will receive four semesters of COBOL training (COBOL Programming, Structured COBOL Programming, COBOL Programming Applications and Programming Applications). The visually impaired programming students will receive twice as much exposure to JCL and Assembly Language compared to the current programming students (at San Antonio College). In addition, the visually impaired will

have one semester of Teleprocessing Programming which is rarely offered on the sophomore level. The curriculum offers less exposure to a spectrum of programming languages, but zeroes in on skills in the greatest demand by the medium and large-size computer installations. The advisory committee feels that this specialized in-depth training will equip the visually impaired programmers with skills that the sighted computer programming graduates cannot offer the employers.

Briefly, the rationale for the courses in the curriculum to train visually impaired computer programmers is:

First semester: Orientation will include campus mobility training and an introduction to the special services available to the visually impaired in addition to the general orientation to the college policies, procedures, general services, and facilities. English and basic accounting courses are the support courses. Data Processing skills will include training on data entry devices, introduction to electronic data processing, and BASIC programming. BASIC programming will be "blocked" with the introduction to EDP class. By the time students move into their BASIC programming studies they will be far enough along in the data entry training to utilize the computer terminals.

Second semester: Support courses include business communications and technical mathematics. Data processing courses will introduce the students to JCL, COBOL programming and computerized file processing.

Third and fourth semesters: (summer semesters) The support course is logic. Data processing courses are structured COBOL programming; system design; plus a seminar designed to expose the visually impaired programmer to "real world" problems and solutions, and to allow the students to become "involved" in the data processing community.

Fifth semester: Students move into advanced programming studies including COBOL applications, Assembly Language, teleprocessing programming, and advanced system analysis and design.

Sixth semester: The support course is Texas Government (a college requirement for an Associate in Applied Science Degree). Data processing courses are advanced Assembly Language, programming applications (a combination of system design and COBOL programming), on-the-job programming experiences (15 hours per week), and a special seminar to prepare the visually impaired for employment as programmers.

Several important points pertaining to the curriculum were studied at length and these observations were made:

1. About 40% of the students entering the program will probably have a bachelor's degree. About 70% of the entering students will have had some previous college work, and will not have to take all of the prescribed courses.
2. Some students, because of their strong academic backgrounds, may select to take more advanced support courses

in place of the prescribed courses. For example, a student may take statistics in place of technical mathematics.

3. The program director may substitute courses in lieu of the prescribed courses if it enhances the student's employment opportunities. (This does not include courses that the college specifies as requirements for an AAS).
4. Some incoming students may not qualify for the program because of weak academic backgrounds. Those students may be directed to remedial-type courses. Once the students meet the entry level qualifications they can join the program with the next group.
5. It will be in the best interests of the students to train one group of visually impaired students at a time.

CONSECUTIVE TRAINING:

"Consecutive training" was coined by the committee to describe a program that would serve one group of students to completion before starting the next group. The primary reason for consecutive training rather than "concurrent" (starting a few more visually impaired students into the program every semester) is to avoid the necessity of many very small segregated classes. In addition to causing financial problems, a large number of small

classes would cause instructor load and classroom scheduling problems. In effect, consecutive training means that the first group of visually impaired students would start the program in the Fall of 1979. The next group would start in the Fall of 1981.

Exceptions to the consecutive training approach can be made by the program director because:

1. A particular student's educational and/or job data processing experience may justify the exception.
2. Student who meet the college's entrance requirements and course prerequistites can enroll in any D. P. classes following the established registration procedures.

ENTRY LEVEL STANDARDS:

Entry level standards used by other schools that train visually impaired programmers, plus those recommended by the blind programmers surveyed during Phase I were studied. This input, plus the committee's guideline to develop a program to train the "intelligent" blind resulted in the entry level criteria (Attachment M). Committee members looked ahead while designing the entry level criteria and tried to make the criteria strong enough to insure that the selected students could and wanted to master the skills, gain employment, and retain employment as computer programmers.

Screening of students applying for admission to the program will be handled by a selection committee. The primary purpose of the selection committee will be to insure that only qualified

students are allowed into the strenuous training. The selection committee will use the entry level criteria listed on Attachment M, but will have the flexibility to consider other abilities and aptitudes that would supplement or replace a particular criterion.

It is proposed that the selection committee be composed of four members including a visually impaired programmer, an employer, and the program director. Screening activities will involve reviewing the student applications and transcripts, interviewing the prospective students, and evaluating autobiographies written by the students. The personal interviews will not be formally structured. The interviews are to be tailored to the students, and the selection committee chairman will be responsible for steering the committee to objective decisions.

SPECIAL DEVICES AND EQUIPMENT:

After reviewing reports and literature pertaining to training devices for visually impaired programming students and employed programmers, the committee recommended devices and equipment for the program. The primary factor in device and equipment selection was maximum training effectiveness. Secondary concern was the availability of the devices to visually impaired programmers after employment. Some of the recommended devices are not standard equipment in programming installations, so the student may be at a disadvantage after employment. However, employers are more likely

to install special devices (such as braille terminals) if the visually impaired programmer(s) have mastered their operation and can vouch for their usefulness. Attachment N contains a listing of the special devices and equipment recommended for the program.

PERSONNEL:

To be effective, three persons are required to implement the program to train visually impaired computer programmers. Each of these persons would be employed on a 12-month contract because the program continues through the summer months. An exception is at the end of the first 21-month program (scheduled to begin in September 1979 and end in May 1981). The summer months following this first program should be used to evaluate and modify the program before the second 21-month program begins in the Fall of 1981. After the second group is trained, the third group may be started in the Summer instead of waiting until the following Fall.

Personnel requirements and qualifications are listed below:

1. Program Director: This person will oversee the program and report to the chairman of the Data Processing Department. The program director will teach at least one three-hour course per semester and will be responsible for all administrative and reporting activities. The director will have to work closely with the state, local, and college organizations, departments, and personnel to take

advantages of services and support for the visually impaired students. Included in the services for the visually impaired are counseling, tutoring, transportation, financing, orientation, etc. The director's qualifications are:

A. A bachelor's degree (a master's degree is preferred).

B. Three years experience in the data processing profession.

C. Experience in computer programming (preferrably COBOL, JCL, and Assembly Language).

D. Administrative experience.

E. Schooling or experience in counseling and education.

F. Approval by the Texas Education Agency and the college district.

2. Instructor: The instructor will teach two courses for the program and be available to the visually impaired students for out-of-classroom assistance. The instructor will be shared by this program and by the data processing department. The committee felt that it would be to the students' advantage if the instructor or the program director were visually impaired. Qualifications for the instructor are:

A. A bachelor's degree (a master's degree is preferred)

B. Three years experience in the data processing area and proficiency in COBOL, JCL, and Assembly Language.

C. Approval by the Texas Education Agency and the college district.

3. Clerk/Typist: This person will perform all of the secretarial tasks related to the program. In addition, the clerk/typist will assist the visually impaired students in the tape and braille library. The qualifications for the clerk/typist are defined by the college district.

Assisting the director and the instructor will be a student assistant (a second-year data processing student) and student tutors. The visually impaired students are expected to remain on campus (probably in the lab area) much longer than the sighted students. It will be necessary to have a qualified instructor, student assistant, or student tutor available to assist them long after their scheduled class hours.

BUILDING SPACE REQUIREMENTS:

The building space requirements were finalized (and changed from those suggested during Phase I). The advisory committee

recommended the following space requirements:

1. An office for the program director.
2. An office for the clerk/typist and instructor.
3. A classroom/lab area. This room would serve as classroom for the segregated classes. When segregated classes are not scheduled, the room will serve as an open lab for the visually impaired students. Special training devices and equipment will be housed in the perimeter of the room.
4. A small room to store the tapes ("talking books") and braille materials that will be checked-out to the students. Extra tape recorders, Perkins braillers, and other materials will also be housed in this library. If the clerk/typist's working area is large enough to store the materials, then this room may not be necessary.

SPECIAL TRAINING FOR INSTRUCTIONAL PERSONNEL:

The director and instructor will need specialized training in the area of counseling and teaching techniques for visually impaired students. This training may be offered on-campus by one of the agencies supporting the visually impaired or it may be off-campus courses or seminars.

Other personnel who should attend all or part of these training sessions include the clerk/typist, the chairman of the data processing department, data processing instructors, support course instructors, technical counselors, and the data processing staff.

SPECIAL SERVICES FOR VISUALLY IMPAIRED STUDENTS:

The project coordinator, in gathering information, interviewed the Director of Special Services, San Antonio College; the Coordinator of Handicapped Student Services, San Antonio College; the Employment Development Specialist, TSCB (San Antonio Office); and the Supervisor of Program Evaluation and Development, TSCB. Services for the visually impaired students available on campus include: orientation, tutoring, readers, counseling, on-campus transportation, conversion to braille, conversion to tapes ("talking books"), and note takers. Services provided by TSCB include readers, purchase of special student equipment (based on the economic needs of the students); conversion to braille and tapes; counseling and guidance; and transportation.

The committee reviewed the available services and concluded that they will meet the needs of the visually impaired students. Some improvements may have to be made to the buildings, but these should be minor changes.

JOB PLACEMENT:

The project coordinator interviewed the Job Placement Counselor, San Antonio College; the Data Processing Placement Committee Chairman, San Antonio College; and representatives from TSCB to gather job placement information. The Job Placement Office at San Antonio College is equipped to work with visually impaired students, and TSCB

offers such services as transportation to job interviews; licenses, tools, and equipment for vocational placement; post-employment services; contacting prospective employers; and the introduction of students to prospective employers. At this stage, no additional job placement services appear to be necessary to place the visually impaired programmers into the job market.

PUBLIC RELATIONS:

During Phase II, public relations efforts resulted in news releases in the San Antonio daily and weekly newspapers. In addition, the campus newspaper, The Ranger, reported on the progress of the project several times. Attachment O contains some of the newspaper articles pertaining to the proposed program to train visually impaired computer programmers.

The college district's public information office released news and feature stories which resulted in radio announcements informing citizens of the proposed training for the visually impaired. Organizations working with the visually impaired also informed (directly or indirectly) prospective students of the program. Blind Texans are hearing about the program as evidenced by local and long distance telephone calls from prospective students and their friends.

POTENTIAL UTILIZATION OF RESULTS OF STUDY:

The post-secondary curriculum developed to train visually impaired computer programmers will provide the graduate with skills

to seek employment as an entry level computer programmer (sometimes classified as a computer programmer trainee or Junior Computer Programmer). Although several Texas community junior colleges have the computer hardware and expertise to implement the proposed AAS program, San Antonio College is the logical choice to offer the training because of its involvement in this study. Visually impaired citizens from the local area, from throughout the state, and from out-of-state will be attracted to the program since it will offer unique training in the southern states.

The advisory committee is anxious for the program to materialize. However there are many variables and unknowns which makes it difficult to propose that a junior college offer the training without a few words of caution. Few (if any) Texas junior colleges have on-campus AAS programs training visually impaired students. Many problems pertaining to counseling, teaching, tutoring, placement, etc. are bound to surface once the specialized training begins. Although cost estimates were prepared, there are still many variables which can affect a rather expensive program designed for a small number of students. It is unlikely that the administrators of a Texas community/junior college will agree to offer the program to train visually impaired computer programmers without more definite cost figures. This is especially true at a time when state educational funds are being challenged by the politicians and the citizens.

Considering the factors named above, the committee recommends that the best approach to implement the program is to apply for state funds for a two-year pilot program to train twelve visually impaired computer programmers. During the pilot program, cost figures will be accumulated and the difference between the actual program costs and the contact-hour revenue will be calculated. Beginning with the third year, a vocational training fee will be charged to offset the difference between contact-hour revenue and actual cost.

PILOT PROGRAM:

The advisory committee recommends that San Antonio College apply for state funds to implement the program to train visually impaired computer programmers effective in the Fall 1979 semester. For training to begin in September, the program director, instructor, and clerk/typist will have to be employed on June first. Although the subject objectives and the curriculum have been developed, many details need to be completed before the program can be placed into operation. Selecting text books; purchasing and/or leasing of special devices and equipment; locating offices, a classroom, and lab space; organizing the screening committee; screening the prospective students; converting text materials into braille and "talking books"; writing and redesigning of detailed course syllabuses; etc., are some of the many tasks that will require a great deal of attention. The program director will have to communicate and work

closely with the various agencies and organizations that serve visually impaired Texans so that prospective students can be made aware of the program. In addition, activities have to be coordinated with other departments on campus. While all of this preparatory work is being carried out, the director, instructor, and clerk/typist will receive special training to work with visually impaired students.

At the end of the pilot program, the program results will be evaluated and recommendations will be made to the state and to the college district pertaining to the continuation of the program.

CONCLUSIONS

The conclusions reached in this study are that there are indeed employment opportunities for visually impaired computer programmers and that they can be trained at a community/junior college. The best training program is a 21-month AAS curriculum as outlined in Attachment L. San Antonio College would be a logical choice to provide the training, starting in the Fall of 1979. Due to the lack of experience in implementing and administering such a program, plus the lack of funds to justify an expensive program for a small number of students, a state-funded pilot program is recommended as a follow-up to this study.

ATTACHMENT A

PROGRAMMING; A "NATURAL" FIELD FOR THE BLIND

Programming Called 'Natural' Field for Blind

By Mary Kincaid
Special to CW

"Computer programming is a natural field for blind students to enter," according to Joyce Van Tuyl, a California transcriber whose braille transcriptions have launched a number of blind students into advanced math careers.

Van Tuyl, along with a band of other volunteers, has been a member of the California Sixth District State PTA Braille Transcription Project since 1968. A graduate of the University of Michigan College of Engineering, her sympathies lie with the thousands of gifted, intelligent blind young people who are inclined toward math and science. This is a group often turned away from their field of interest by counselors, who themselves may find math and science "impossibly difficult" and, therefore, unappealing.

Van Tuyl, who is fully sighted, signed up for the first adult education class in braille offered in Palo Alto in 1956. It was a providential choice. The tasks involved were intellectually stimulating and rewarding, and the need for trained personnel to learn the alphabet and the technique of transcribing it by machine was urgent.

15% Know Braille

Although braille transcriptions enable the blind to read textbooks, enrich their lives by reading the world's best literature, or follow new recipes from gourmet cookbooks, only 15% of the blind population knows how to read braille.

There are several reasons for this surprising statistic. Those who become blind as adults are often defeated by the enormity of their misfortune. They simply don't have the will to try to learn. On the other hand, the optimists don't want to learn because they believe their blindness is temporary.

In addition, many blind people are diabetic. They often have a reduction of the sensation of touch, preventing them from using their fingertips quickly to sense the pattern of raised dots that form the braille alphabet and other braille symbols.

During the '50s, better braille code was designed for math. The old math symbols, with positions both above and below line, and the incorporation of several foreign alphabets had prevented transcribers from using them in the rigidly coded single-line braille system used for text.

In 1952, Dr. Abraham Nemeth, now a mathematics professor at the University of Detroit, devised a way to adapt the existing braille system to incorporate modern math symbols.

Logical Link

"Computer programming," Van Tuyl said, "is a natural field for intelligent blind students, because from childhood on they have had to organize and systematize every aspect of their lives: Socks, kitchen utensils and furniture are all placed in specific places for ordered and efficient use. This is exactly the systemized procedure in which computer programmers must be trained to think. That practice sometimes even puts them ahead of sighted programming students."

A number of young Californians for whom Van Tuyl had transcribed textbooks have grown up and gone on to study advanced math. One boy received his BA in math at Stanford University, then took a Masters in operational research. Another of her students is now doing graduate work in computer science at Georgia Tech.

The Braille Transcription Project, sponsored by the Sixth District California State PTA, has been in operation for 21 years, not only training volunteers in transcription, but also in recording texts on tape.

Before a transcription is begun, a search is made with the American Printing House for the Blind, in Louisville, Ky., to see whether the requested text is already available. If not, a volunteer is assigned to the task.

Volunteers work at home on small machines that transform printed words into the raised dot patterns on paper. If that material is to be made into a book, these pages are duplicated a second time on more durable plastic sheets that will withstand the pressure of the readers' fingertips for a longer time.

Understandably, more pages and more labor hours per page are required to produce a book in braille than in print. The Transcription Project has produced such time-consuming volumes as Roget's *Thesaurus*, that in braille requires 45 volumes. A special system is used to transcribe music.

The project receives no funds from any governmental source. The thousands of hours per book are donated entirely by volunteers except for the paid work done by the blind proofreaders.

The Education for All Handicapped Children Act, passed in 1975, grants all children the right to a free public education. The federal government will now underwrite only 5% of these costs, but by 1982 will supply 40%. In the meantime, volunteers are needed.

Those interested in contributing to the cause may write to the National Braille Association, 85 Godwin Ave., Midland Park, N.J. 07432, or to the California Transcribers and Educators of the Visually Handicapped. Gifts and Tributes Chairperson for the latter is Margaret Parenty, 1103 Ortega Rd., Pebble Beach, Calif. 93953.

Kincaid is a freelance writer from Ann Arbor, Mich.

67

63

ATTACHMENT B

EMPLOYERS QUESTIONNAIRE

(Employment Opportunities for Visually Impaired Computer Programmers)

Employment Opportunities
for
Visually Handicapped Computer Programmers

A Feasibility Study Conducted by San Antonio College and Funded by
The Texas Education Agency

SECTION ONE: Demographic Data

1. Size of installation (use your annual D. P. budget as a guideline):

_____ Small (less than $250 K) _____ Medium ($250 K-$1,000 K) _____ Large (over $1,000 K)

2. Primary computer system(s) in use:

_____ Manufacturer/System _____ Manufacturer/System

3. Two most commonly used languages and estimated percentage of total programming effort:

_____ Language / % _____ Language / %

4. Type of formal in-service training for programmer:

_____ Comprehensive _____ Limited _____ None

5. If formal in-service training is provided, are newly-employed programmers required to take this training?

_____ Yes
_____ Depends on previous programming experience
_____ Depends on previous programming schooling
_____ Depends on a combination of things

6. Use of programming teams:

_____ All programmers work in teams
_____ Most programmers work in teams
_____ Some programmers work in teams
_____ Programming teams are not used

7. Employment of handicapped programmers.

_____ Have employed visually handicapped programmers
_____ Have employed other handicapped programmers
_____ Have not employed handicapped programmers

(over)

8. Applications from handicapped programmers:

_____ Have received applications from visually handicapped programmers
_____ Have received applications from other handicapped programmers
_____ Have not received applications from handicapped programmers

9. Classification and number of programmers:

CLASSIFICATION	1978	1983 (Est.)
Business Applications Programmer	_____	_____
Scientific Applications Programmer	_____	_____
Programmer/System Analyst	_____	_____
System (Software) Programmer	_____	_____
List classifications that cannot be included in the above:		
_____	_____	_____
_____	_____	_____
TOTAL	_____	_____

SECTION TWO: Research Date

Please Rate the following Statements:

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
1. I would consider employing a visually handicapped programmer.					
2. I would consider employing a visually handicapped programmer if I had the opportunity to work with the student during an internship program.					
3. Top management encourages me to hire visually handicapped employees.					
4. All qualifications being equal, I would probably offer a vacant programming position to a visually handicapped applicant.					
5. I would be willing to install a special device or terminal to assist the visually handicapped programmer.					
6. My primary hesitation (if any) to employing a visually handicapped programmer deals with our physical facilities.					
7. My primary hesitation (if any) to employing a visually handicapped programmer deals with attitudes and emotions.					
8. I would be more inclined to employ a visually handicapped programmer if I had input to the training curriculum.					

73

72

(over)

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
9. I feel that it is possible to train visually handicapped programmers for the position(s) in our installation.					
10. We have a detailed list of tasks or duties to be performed by firm's programmers.					
If yes, I feel that a visually handicapped programmer can perform the specified tasks or duties.					
11. We have a written job qualification for our programming position(s).					
If yes, I feel that a visually handicapped programmer could satisfy the specified qualifications.					
12. We sometimes make "trade offs" between the required job qualifications and other accomplishments (schooling, experience, etc.) when employing programmers.					

13. Please list those duties (if any) performed by your programmers that you feel could not be performed by a visually handicapped programmer.

75

74

If you answered no (probably not or definitely not) to statements numbered 1, 4, 9, 10b, and 11b please comment on your reactions.

SECTION TWO: Research Date

Please Rate the following Statements:

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
1. I would consider employing a visually handicapped programmer.					
2. I would consider employing a visually handicapped programmer if I had the opportunity to work with the student during an internship program.					
3. Top management encourages me to hire visually handicapped employees.					
4. All qualifications being equal, I would probably offer a vacant programming position to a visually handicapped applicant.					
5. I would be willing to install a special device or terminal to assist the visually handicapped programmer.					
6. My primary hesitation (if any) to employing a visually handicapped programmer deals with our physical facilities.					
7. My primary hesitation (if any) to employing a visually handicapped programmer deals with attitudes and emotions.					
8. I would be more inclined to employ a visually handicapped programmer if I had input to the training curriculum.					

(over)

ATTACHMENT C

MINI SURVEYS OF TEXAS DATA PROCESSING MANAGEMENT ASSOCIATION CHAPTERS

SAN ANTONIO COLLEGE 1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

August 17, 1978

TO: Texas DPMA Chapter Presidents

FROM: Steering Committee
Feastibility Study to Investigate the Employment Opportunities for Blind and Visually Impaired Computer Programmers

SUBJECT: Input to Study by Texas DPMA Chapters

San Antonio College is conducting a Texas Education Agency funded project pertaining to the employment opportunities for blind and visually impaired programmers. Most of the detailed data for the study is being gathered in the San Antonio area. In order to obtain state wide opinions, we are asking the DPMA presidents to make a mini-survey at their next membership meeting.

Please ask your DPMA members to respond to the three questions on the attached form and return it in the stamped, self-addressed envelope. Thank you very much for your cooperation and a speedy reply!

Sincerely,

Al Stehling, CDP
DPMA Member, San Antonio Chapter

DPMA Survey

Instructions: Only those DPMA members and guests who supervise (manage) programmers are to respond and only one respondent per installation. Supervisors (managers) are to answer questions with a show of hands. After each question count the raised hands and record totals in the appropriate spaces. Thank you!

1. Do you have any vacancies for programmers at this time?

   Yes_____ No_____ Uncertain_____

   If yes, how many vacancies?

   1 to 3 _____
   4 to 6 _____
   More than 6 _____

2. Would you consider hiring a blind or visually impaired programmer?

   Yes_____ No_____ Uncertain_____

   If No or Uncertain, would you be willing to talk to an employer of a blind or visually impaired programmer to become more familiar with the advantages and disadvantages of blind and visually impaired programmers?

   Yes_____ No_____ Uncertain_____

3. Do you feel that a program to train blind and visually impaired programmers should be offered in Texas?

   Yes_____ No_____ Uncertain_____

Chapter:_____ Date:_____

Do you want a summary of the results of this mini-survey? (check one)

Yes_____ No_____

Please return promptly to:

Al Stehling
San Antonio College
1300 San Pedro Avenue
San Antonio, Texas 78284

ATTACHMENT D

QUESTIONNAIRE TO DEPARTMENT CHAIRPERSONS

SAN ANTONIO COLLEGE 1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

September 6, 1978

TO: Chairpersons

Business Administration Department
Business Technology Department
English Department
Government Department
Mathematics Department
Orientation Department
Reading Department
Library

FROM: Al Stehling AJS

SUBJECT: Request for Input to Study

We are nearing the completion of Phase I of a TEA funded feasibility study to determine the employment opportunities and the training requirements for blind and visually impaired computer programmers. Although all departments on campus have some of our data processing majors in their classes, the aboved named departments are most likely to work with our computer programming majors. We feel that our study would be incomplete without input from your office because the blind and visually impaired students (if a program to train blind programmers were to materialize) would probably sign up for your courses or use your facilities.

Please complete the very brief questionnaire on the attached page and return to us promptly. Your individual reactions will be kept confidential!

Thank you for a speedy reply.

Please check the column which best describes your honest reaction to the following statements.

	Yes	Undecided	No
1. Blind and visually impaired students can be "mainstreamed" into the classes taught by our department.			
2. Our department would be able to schedule special class sections to offer segregated instruction for the blind and visually impaired students.			
3. Our department would be able to provide small classes (6 to 8 students), if necessary, to serve blind and visually impaired students.			
4. Our department would be able to provide special training devices to assist the blind and visually impaired students.			
5. Arrangements could be made in our department to provide tutoring and other special services to insure that the blind and visually impaired can reach our course objectives.			
6. Our department could provide courses that would meet longer than the normal class periods so the training could be completed before the end of the scheduled semester.			
7. Our department could provide a faculty member who would serve as a liaison for the planning and instructional phases in the training of blind and visually impaired students.			

Signed:_____ Date:_____

Return to Al Stehling, Box 40. Thank you for a speedy reply.

ATTACHMENT E

QUESTIONNAIRE TO BLIND PROGRAMMERS

SAN ANTONIO COLLEGE 1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

August 11, 1978

The Texas Education Agency has funded a study by San Antonio College to investigate the employment opportunities and training of visually handicapped computer programmers. As part of this study, we are surveying employeers of computer programmers to determine their attitudes towards the employment of blind and visually impaired programmers. While this information is being gathered, we are asking blind programmers to provide their expertise pertaining to the training requirements.

I'm sure you can recall those training subjects and techniques which proved very meaningful. And you can probably list a few subjects that you feel should have been included in your schooling. This is your opportunity to provide input for a proposed curriculum for blind programmers.

In event San Antonio College does provide training for the blind and visually impaired programmers, the curriculum will be based on feed-back from you and other concerned blind programmers. Since we have a limited number of names and addresses of blind programmers, it is important that we receive a response from you to make this study valid.

Please ask your reader to record your answers on the attached questionnaire and return it in the enclosed stamped, self-addressed envelope. A speedy reply is necessary to make up for the delays in obtaining the names and addresses of employed blind programmers.

Thank you very much for sharing your time and opinions with us. All returned questionnaires will be kept confidential and respondents will receive a summary of the questionnaire results.

Sincerely,

Al Stehling, CDP
Project Director

NAME:_____DATE:_____

Please ask your reader to fill in the blank spaces to record your honest reactions.

1. At what age did you lose your sight?_____

2. What was the highest educational level you reached before you lost your sight?_____

3. What is the highest educational level you reached after you lost your sight?_____

4. Were you employed in the data processing or a related field before you lost your sight?_____

5. What was your primary occupation before you lost your sight?

_____

6. Where did you receive your programming schooling? (check one)
___on-the-job training
___trade school
___college or university

What was the length of programming training at the above?_____months

What was the length of schooling per school day?
_____hours

Was the above training sufficient to qualify you for an entry-level programming position?_____

7. What was the name of the school or company that trained you?

_____

8. Were you married at the time you received your programming training?_____

9. What were your most commonly used source of out-of-classroom learning materials. If more than one, list the estimated per cent of usage.

Braille materials _____%
Audio tapes _____%
Readers _____%
Tutors (other than readers _____%
Others (please list)

_____

_____

10. Did you receive your training at a school that taught only blind students?_____

11. Do you feel that blind students could be taught how to program if they enrolled in schools primarily for sighted students?_____

12. For what particular programming position should the blind be trained? (check all appropriate positions)

___business programmer
___scientific programmer
___software programmer
others (please list)

___ _____
___ _____
___ _____

13. What is the size of the programming staff in the computer installations that you feel would be most likely to hire a blind programmer? (check appropriate sizes)

___One to five programmers
___Six to fifteen programmers
___Sixteen to thirty programmers
___Thirty-one to one hundred programmers
___Over one hundred programmers

14. How many programmers are employed by your installation?___

15. Do you work as part of a programming team? (check one)
Yes, most of the time____Yes, sometimes____No____

16 Do you feel that blind programmers would be more productive if they worked as part of a programming team?_____

17. Do you feel that the level of education a blind programmer has reached, has a direct effect on his employment opportunities?
_____

If yes, what level of education would provide best employment opportunities for the blind programmer? (check one)

___High school
___One-year training program
___Two year of college
___Bachelor's degree
___Master's degree

18. Do you feel that blind candidates for a programming school should be screened by a panel of programmers before they are allowed to enter the school?_____

19. What special devices (if any) does the employer furnish so you can perform your programming duties? (please list).

_____

_____

_____

20. What programming tasks (if any) are being performed by sighted programmers which you cannot perform? (please list)

_____

_____

_____

_____

_____

21. What services can you offer to the employer to "trade-off" for the programming tasks (if any) you cannot perform? (please list)

_____

_____

_____

_____

_____

Please rate the following statements by asking the reader to record your feelings in the appropriate column. Please rate every entry.	Definitely Important (must have)	Important (should have)	Uncertain Undecided (maybe)	Not Important (Can probably do without)	Definitely Unimportant (of no value)
22. Blind programmers must be better trained than most sighted programmer.					
23. Internship (on-the-job training) should appear in the curriculum for blind programmers.					
24. The instructors who teach the blind programming students need special training.					
25. Student tutoring should be provided for the blind students.					
26. Faculty tutoring should be provided for the blind students.					
27. Special counseling services should be provided for the blind students.					
28. Very strict entry-level qualifications must be maintained for the blind students.					
29. Braille output of the students compile and test runs should be provided.					

90

91

OVER

Entry level qualifications for blind programming students should include:	Definitely Important (must have)	Important (should have)	Uncertain Undecided (maybe)	Not Important (Can Probably do without)	Definitely Unimportant (Of no value)
30. Strong desire to independent.					
31. Willingness and ability to relocate.					
32. Good health					
33. High school graduate					
34. Good grooming					
35. Good verbal communication					
36. Good mathematical background.					
37. Proficiency in braille					
38. Mobility (independent movements, with or without a cane)					
39. Others (please list)					
40.					
41.					
42.					

92

93

Please complete the next section of the questionnaire in three steps. Do not move to the next step until the previous step has been completed.

Step One:

Listed below are the courses included in a two year Associate Degree Curriculum to train sighted entry-level junior programmers. Please rate each of these courses by your perception of their importance in a curriculum to train blind programmers. Check the appropriate column to the right to record your rating. Please rate every entry!

METHOD	DATA PROCESSING COURSES:	Definitely Important ("Must Know")	Important ("Should Know")	Uncertain Undecided	Not Important (of little value)	Definitely Unimportant (of no value)
	Introduction to Computers					
	BASIC Programming Language					
	RPG II Programming (1st Semester)					
	RPG II Programming (2nd Semester)					
	Job Control Language					
	COBOL Programming (1st Semester)					
	COBOL Programming (2nd Semester)					
	System Design (1st Semester)					
	Advanced System Design (2nd Semester)					
	FORTRAN Programming					
	Assembly Language (1st Semester)					
94	Mini-Computers					
	Data Processing Applications					

(OVER)

METHOD	DATA PROCESSING COURSES: (Continued)	Definitely Important ("Must Know")	Important ("Should Know")	Uncertain, Undecided	Not Important (of little value)	Definitely Unimportant (of no value)
	SUPPORT COURSES:					
	English Composition (1st Sem.)					
	English Composition (2nd Sem.)					
	College Algebra					
	Statistics					
	Accounting (1st Sem.)					
	Accounting (2nd Sem.)					
	State Government					
	Orientation to College					

Step Two:

Add the data processing and support courses you feel should be included in the program by listing those courses on the blank lines provided. Rate the courses by their importance to the blind programming students.

Step Three:

The classes can be presented to the students in one of two methods. The blind student can be mainstreamed into the regularly scheduled classes along with the sighted students. Traditional teaching methods utilizing lectures, blackboards, overhead projectors, and films are common in these classes. Or the blind student can be placed into segregated or special classes for the blind. Please classify those classes you rated as "very important" and important" into the method of course presentation by printing an M (mainstreaming) or S (Segregated) in the method column to the left of the course listing.

Return To:

Al Stehling
San Antonio College
1300 San Pedro Avenue
San Antonio, TX 78255

99

93

This is a special project developed by San Antonio College and Funded by the Texas Education Agency

ATTACHMENT F

RESOURCE PEOPLE AND ORGANIZATIONS

SUMMARY OF RESOURCE PEOPLE
and
ORGANIZATIONS CONTACTED

Information Requested	Resource	Feed Back
Training Procedures	University of Manitoba	Package
	Manufacturers Hanover Trust	Package
Names and addresses of schools that train blind programmers	Texas State Commission of the Blind	Letter
Task analysis, employment statistics of handicapped programmers, job forecasts, etc.	Educational Director, AEDS	No Data available
	Educational Director, ICCP	None
	Educational Director, DPMA	No Data available
	Educational Director, AFIPS	None
	Educational Director, ACM	None
	Philip Gensler	No Data available
Problems involved with training Blind Programmer	Williard Finch, Director of Pitt Technical Institute	Letter
Copy of report on Selection Training, and Placement of Blind Programmers and ACM Reports	Association for Computing Machinery	None
Statistics, Reports	System Development Corp.	Package
	MedComp Research Foundation	None
Task Analysis & Statistics	Ohio St. University	None

Information Requested	Resource	Feed Back
Training, employment opportunities, statistics, reports	R. E. Taylor	None
	L. J. Wilson	None
	Richard Roth	None
	W. R. Schaefer	None
	Bob Wallace (Resource people listed in 1977 Technology Transfer Directory)	None
Number of Blind, Post-Secondary training for the Blind, Data pertaining to Blind Programmers	Texas Society for Prevention of Blindness	Statistics
Handbook of demographic data	Governors Coordinating Office for the Visually Handicapped	Handbook
Name and addresses of Blind Programmers	Visually Impaired Data Processors, International	None
	Texas State Commission of the Blind	Letter
Selection, training, placement, costs, special training devices length of program, etc.	MedComp Research Foundation	None
	System Development Corp.	Package
	Arkansas Enterprises for the Blind	None
	Columbus Technical Inst.	None
	Baruch College	Package

Information Requested	Resource	Feed Back
Selection, training, placement, costs, special training devices length of program, etc.	Computer Systems Institute	None
	Hadley School for the Blind	None
Information about Arts Services	Arts Service Bureau	None
Number of prospective blind Texans qualified to enter training for Computer Programming	S. A. Commission for the Blind	None
	State Commission for the Blind	Letter
	Governor's Coordinating Office for the Visually Handicapped	None
Reactions to additional cost to train Blind Programmers	Dean of San Antonio College	Note
Services for blind, costs to user department, etc.	Counselor for Handicapped, San Antonio College	None
Reasons for discontinuing training of blind programmers	Computer Systems Institute	None

ATTACHMENT G

PROFILE OF A PROGRAMMER

PROFILE OF A PROGRAMMER

Source: Encyclopedia of Careers and Vocational Guidance, 1975

Definition of Programmer:

It is their job to write and to code the instructions which control the work of a computer.

Nature of Work:

1. A programmer analyzes the request which is being made of the instrument, obtains from the persons who make the request information about the kinds of results which they want, discovers the kinds of data which will be needed in order to attack the problem, and plans the way in which the machine will have to respond in order to produce the information which is required of it.
2. He prepares a flow chart which will show the steps in sequence which the machine must make.
3. He must pay attention to minute detail and instruct the machine in each step of the process.
4. When the program is completed, he tests its working practicality by having it perform on simulated data.
5. If the machine responds according to expectations, actual data will be fed into it and the program will be activated. If it does not respond as anticipated, the program will have to be "debugged", or examined for errors which must be eliminated.

Requirements:

1. Most employers of programmers specify that they prefer college graduates. However, employers have been known to take persons as programmers who have attended college but who have not graduated.
2. Personal qualifications such as a high degree of reasoning ability, patience, and persistence and an aptitude for mathematics are often as influential as formal training in obtaining entry positions with data systems.
3. Employers usually send the new employee to a computer school before he will be qualified to assume programming responsibilities. He is usually sent to school at company expense; the training period may last as long as five weeks.
4. It generally takes a year or more before a programmer can master all aspects of his job.

Special Requirements:

Ability to solve difficult problems in a logical and objective manner is the programmer's official requirement. There are no special license he must hold.

Employment Outlook:

For the decade, employment opportunities for programmers, both men and women, should be excellent. A rapid increase in employment is expected as the increasingly complex demands of our economy result in the necessity of computer usage.

Conditions of Work:

Most programmers work under pleasant conditions. The machines require an atmosphere which is dust free and in which the temperature is constant both in summer and in winter. Those who work with the machines benefit from such requirements.

Since machine operations are usually fairly new in most agencies and firms, the offices in which they are housed are usually newly designed and decorated. Although most of the facilities are not luxurious, they are clean, modern, and well equipped.

The work week for the average programmer is between 35 to 40 hours. However, the circumstances surrounding each job make for variations in the specified pattern. In some job situations, the programmer may have to work some nights or weekends when the program is going through its trial runs, or when there are many demands for additional services.

Most programmers receive adequate vacation and sick leave, and are included in such company benefits as group insurance and retirement benefit plans.

Source: Introduction to Data Processing, 1977, Gary S. Popkin and Arthur H. Pike

Programmers, at the beginning level:

1. Assist in converting the specifications of systems analysts into detailed, logical flowcharts for coding into a computer programming language.

2. Often confer with computer users to find out (a) exactly what the user expects the program to do, (b) exactly what the output is supposed to be, and (c) what the input to be supplied is.

3. Supply the internal checks and controls in the programs they write that will ensure that data will be properly processed into information.

4. Make up sample data to use as input to determine if a newly written program does indeed work properly.

5. Write clear instructions to the other humans involved in the human-machine relationship.

6. Seek out and correct whatever is wrong until the program runs without any apparent errors.

ATTACHMENT H

COMMON TASKS PERFORMED BY AIR FORCE PROGRAMMERS

COMMON TASKS PERFORMED BY

AIR FORCE PROGRAMMERS

COMMON TASK PERFORMED	PERCENT MEMBERS PERFORMING
DESK CHECK PROGRAMMING LOGIC	84
ISOLATE AND CORRECT PROGRAM LOGIC ERRORS	77
ISOLATE AND CORRECT SYNTAX ERRORS	74
DESK CHECK PROGRAM DECK FOR KEYPUNCHING ERRORS	72
CODE COBOL ROUTINES	65
REVIEW COMPILATION OR ASSEMBLY OUTPUTS FOR ERRORS	64
READ COMPUTER DUMPS FOR PROGRAM BUGS	61
CONDUCT OPERATIONAL FIELD TESTS OF NEW OR REVISED PROGRAMS	55
WRITE OR UPDATE DOCUMENTATION FOR PROGRAMS	51
PREPARE SYSTEM OR PROGRAM TEST DATA	51
PREPARE CHANGES TO CORRECT ERRORS OR IMPROVE OPERATIONAL PROGRAMS	50
DESIGN RECORD FORMATS	less than 50
DESIGN REPORT FORMATS	less than 50
PREPARE DETAILED PROGRAM FLOW CHARTS	less than 50

ATTACHMENT I

DATA COLLECTION FORM

(Used at on-site visits to training centers
for
visually impaired computer programmers)

Data Collection Sheet
Training of Blind and Visually
Impaired Computer Programmers

Section I -- Curriculum

1. Courses Taught:

SUBJECTS	HOURS CREDIT	CLASS	LAB	HOMEWORK
A.				
B.				
C.				
D.				
E.				
F.				
G.				
H.				
I.				
J.				
K.				
L.				
M.				
N.				
O.				

2. Presentation of Material:

A. Lecture: _____

_____

B. Tapes: _____

_____

C. Films: _____

_____

D. Braille:

E. Hands-on (Labs)

F. Internship:

G. Others:

3. Student Text Materials: (Type, cost, advantage, disadvantage, comments)

A. Braille

B. Tapes

C. Others

4. Training Aids: (Use and cost)

A. Braille Printer

B. Braille Terminal

. Audio Terminal

D. CRT Optacon

E. Others

5. Comments:

Section II -- Students

1. Recruitment

2. Previous Schooling

3. Prequisities

4. Selection (Screening)

5. Profile of Average Student

A. Age _____

B. Sex _____

C. Educational Background _____

D. Health _____

E. Degree of Visual Impairment _____

F. Financial Background _____

G. Marriage Status _____

H. Age Sight Was Lost _____

I. _____

J. _____

K. _____

L. _____

M. _____

N. _____

Section III - Faculty

1. Director (Coordinator) _____

_____

_____

2. Faculty:

A. Special Training _____

_____

B. Sighted or Unsighted _____

_____

C. Programming Experience _____

_____

D. Educational Background

E. Faculty/Student Ratio

F. Working Hours

G. Work Schedule

H. Faculty Tutoring

I. Out of Classroom/Lab Contact with Students

J. Other Faculty Considerations (Number, Salary, Age, etc.)

Section IV ---Counseling

1. Special Counselors (number, Duties, Hours, etc.)

2. Special Training Requirements for Counselors

3. Other Counseling Considerations (Sighted vs Unsighted, etc.)

Section V -- Laboratory Assistants

1. Need for Aides

2. Qualifications, Hours, Salary, Duties, etc.

Section VI -- Tutoring

1. Student Tutoring

2. Faculty Tutoring

3. Tutoring by Blind Programmers

4. Hours of Tutoring

5. Cost of Tutors

6. Other Tutoring Considerations

Section VII -- Mainstreaming

1. Comments

Section VIII - Special Instruction

1. Individualized Instruction

2. Size of Classes

3. Segregated Classes

4. Repeating all or Part of A Class

5. Other Considerations

Section IX -- Program Structure

1. Length of Program

2. Length of School Days

3. Breaks, Holidays, etc.

4. Program Completion Certificate or Degree

Section X -- Non-Data Processing Courses

1. Which are most important? (Why?)

2. Which are least important? (Why?)

3. Other Considerations:

Section XI -- Costs

1. On-Going Costs (Annual Budget)

   A. Faculty

   B. Hardware/Software (Type and costs)

   C. Special Devices for Blind

   D. Counseling

   E. Tutoring

   F. Learning Materials (List)

G. Overhead

H. Other On-Going Costs

2. One-Time Costs

A. Modifications to Facilities

B. Purchase of Special Devices

C. Other One-Time Costs

3. Costs Per Student

4. Costs Per Student Contact Hour

Section XII -- Student Costs

1. Who Pays?

2. How much?

3. Student Cost Items: (List)

4. Other Student Cost Considerations

Section XIII -- Revenues

1. Tuition

2. State Funding

3. Local Funding

4. Federal Funding

5. Funding From Organizations

6. Other Revenues

Section IX -- Problems?

1. Students With Different Educational Background

2. Different Degrees of Visual Handicap

Section X -- Opinions

1. Can Training Be Performed on College Campus?

   A. Semester Lengths

   B. Class Periods

   C. Class Days Lengths

   D. Holidays, Spring Breaks, Breaks between Semesters, etc.

   E. Rush From Class to Class

   F. Five Subjects At One Time

G. Comments _____

_____

_____

_____

_____

Section XI -- Other Observations

_____

_____

_____

_____

_____

_____

_____

_____

School _____

Director _____

Address _____

_____

_____

ATTACHMENT J

FIRST QUARTERLY REPORT

SAN ANTONIO COLLEGE 1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

October 5, 1978

TO: Ray Barber, Director, Exemplary and Innovative Programs, TEA

FROM: Al Stehling, Project Coordinator

SUBJECT: Quarterly Progress Report; Feasibility Study and Development of a Program to Train Visually Impaired Students in Computer Programming

The original application for funds for exemplary and innovative programs was submitted on March 17, 1978. A revised proposal was submitted on April 4, 1978. Authority to start the project was received by San Antonio College on July 3, 1978.

The following persons were contacted and agreed to serve on the steering committee for Phase I of the project:

1. Dr. Robert Bottenberg (blind)
   Chief Computational Sciences Division
   Air Force Human Resources Laboratory
   Brooks Air Force Base

2. O.C. "Bud" Davidson (visually impaired)
   Deputy Director of Individual Assistance Services
   Governor's Coordinating Office for the Visually Handicapped
   Austin, Texas

3. Robert M. Hackett (employer)
   Director, Application Services
   City Water Board
   San Antonio, Tx

4. Sharon Lynn Hill (counselor)
   Counselor/Coordinator for Handicapped Students
   San Antonio College

5. Dr. Max Jabs (administrator)
   Associate Dean of Instruction
   San Antonio College

6. Patricia F. Lindey (educational agency)
   Coordinator, Vocational Curriculum
   Texas Education Agency
   Austin, Texas

7. Edward Marquardt (blind, retired)
   Computer Programming Instructor
   San Antonio, Texas

8. Walter Musler (blind)
   Program Director, Piano Tuning
   San Antonio College

9. Chester Neeley (blind programmer)
   Automation Officer, Systems Research
   Frost National Bank
   San Antonio, Texas

10. Charles Raeke (blind)
    Supervisor of Program Evaluation,
    Planning and Development
    Texas State Commission for the Blind
    Austin, Texas

11. Frank Sievers (employer)
    Vice-President
    Frost National Bank
    San Antonio, Texas

12. Al Stehling (project coordinator)
    Chairman, Data Processing
    San Antonio College

13. Bob Wiley (blind programmer)
    Programmer and System Analyst
    City Water Board
    San Antonio, Texas

Other persons who were invited to attend all committee meetings were:

1. Ray Barber, Director
   Exemplary and Innovative Programs
   Texas Education Agency
   Austin, Texas

2. Nellie Thorogood, Director
   Occupational Education and Technology
   San Antonio College

The first steering committee meeting was held in the Madrid Room at San Antonio College on July 11, 1978. Members and guests present were Barber, Hill, Jabs, Marquardt, Musler, Raeke, Sievers, Stehling, Thorogood, and Wiley. Based on a report by Raeke that experiences in his office indicated that only a 15% response to mail-out questionnaires pertaining to blind could be expected, the committee agreed that the best way to gather employment opportunity data was thru personal interviews. The committee determined that the employer's population be San Antonio, with five samples each from Houston, Dallas, and Austin. Hill, Sievers, and Jabs agreed to meet with Stehling to develop the employment opportunity questionnaire.

Committee members agreed that data pertaining to the training requirements could best be gathered from blind programmers and schools that train blind programmers. All committee members were given resource sheets and self-addressed envelopes so they could mail "leads" to the project coordinator as they happened to come across resource people, materials, and organizations. About half of the committee members sent resource leads to the project coordinator during Phase I.

Minutes of the first steering committee meeting were mailed to all members. Members who were not present at the meeting were mailed a packet (copy of the approved project, list of members, data sheets and resource forms) distributed at the meeting.

On July 14, Stehling and Jabs (Hill and Sievers were unable to attend) met to develop the questionnaire to gather employment opportunity data from the employers. Copies of the proposed questionnaire were mailed to all steering committee members on July 18 with a cover letter requesting suggestions for improvements. Several committee members submitted good suggestions and the questionnaire was modified to include the proposed changes.

During the month of August, the project coordinator visited San Antonio employers (data processing managers) and completed the employment opportunities (or employers) questionnaires during personal interviews. Gathering the employment data by personal interviews proved very time consuming (calling for appointments, waiting in offices, appointment cancellations, travel and parking delays, etc.). On August 22, 23, and 24 the project coordinator made a three day trip to interview employers in Houston, Dallas, and Austin. Because the original proposal did not plan for personal interviews, this part of the study (1) required a great deal of the project coordinator's time and (2) resulted in in-city and out-of-city travel expenses that had not been pre-planned.

The results of the employers interviews were summarized in three groups, namely: San Antonio employers (48), samples from Houston, Dallas, and Austin (15), and all employers (63). Only one employer refused to share his opinions with the project coordinator.

In July, the project coordinator developed a proposed questionnaire to be mailed to the blind programmers. Samples were mailed to blind programmers on the steering committee asking them for their comments and suggestions for improvements. On August 2, the project coordinator met with Mr. and Mrs. Chester Neeley to modify the form. On August 14, eleven questionnaires were mailed to blind programmers. Ten of these names and addresses were supplied by Charles Raeke. Between August 15 and mid-September, seven more questionnaires were mailed to blind programmers as the project director found their names in resource materials and news articles.

Several of the questionnaires to the blind were returned due to incorrect mailing addresses, or with notes stating that the person

was not blind or that the person was not a computer programmer. Six questionnaires were completed and summarized for the steering committee. Since that time two more completed questionnaires have been received from blind programmers.

Frank Sievers submitted a proposed DPMA (Data Processing Management Association) questionnaire to the project coordinator in mid-July. The project coordinator made minor changes to the questionnaire and sent a copy to all steering committee members. There was no response or feed-back concerning the DPMA questionnaire from the steering committee. On August 17, the project coordinator mailed seventeen DPMA questionnaires to the Texas chapter presidents with instructions to survey the membership at the next regular meeting. Four of these questionnaires were returned prior to the steering committee's September meeting. Two of these questionnaires were completed incorrectly. A fifth DPMA questionnaire was returned in early October, and it too was filled out incorrectly.

On September 6, the project coordinator mailed a questionnaire to eight department chairpersons at San Antonio College. These departments would be likely to have the blind computer programming students in one or more of their department classes. Seven chairpersons questionnaires were returned and summarized for the steering committee.

During Phase I, the project coordinator wrote letters requesting input to the study to resource people and organizations which included: professional data processing organizations, employers of blind programmers, schools that train blind programmers, schools that used to train blind programmers, Ohio State University (task analysis), resource people listed in the 1977 Technology Transfer Directory, organizations that work with the blind, authors of articles in professional journals and newspapers, the dean of the college, the campus coordinator of the handicapped, etc. Some of the resource people and organizations did not reply, some sent referrals to other resource people, some sent short and/or futile replies, and some returned very meaningful contributions to the study. Two observations should be pointed out: (1) Phase I may have been too short to locate and receive feed-back from resource people and organizations, and (2) very few resource people expressed their experiences and/or opinions in writing. Most replies were copies of printed materials.

At the first steering committee meeting members requested a "profile of a programmer." In early July the project coordinator visited the Air Force Human Resource Laboratory to review literature pertaining to the data processing job clusters and task analysis. Copies of the common tasks performed by Air Force Programmers were mailed to the steering committee members on July 24. Efforts to obtain task analysis for computer programmers from Ohio State University proved fruitless.

Literature pertaining to the training of blind programmers was obtained from various training centers including:

1. System Development Corporation
   Santa Monica, California

2. University of Manitoba
   Winnipeg, Manitoba, Canada

3. Columbus Tech
   Columbus, Ohio

4. Computer System Institute
   Pittsburg, Pennsylvania
   (Note: They no longer train blind programmers)

5. Arkansas Enterprises for the Blind
   Little Rock, Arkansas

6. Medcomp Research Foundation
   Cincinnati, Ohio

Data pertaining to the above six training centers for visually impaired computer programmers was packaged and made available to the steering committee at the September 27th meeting. In addition to the above training centers, the Pitt Technical Institute in Greenville, North Carolina responsed to our request for input. Their efforts to train blind computer programmers have been unsuccessful.

On September 11 thru September 14, the project coordinator made a four-day trip to visit two schools that train blind/visually impaired computer programmers. A two-day visit was made to the Arkansas Enterprises for the Blind in Little Rock, Arkansas and another two-day visit was made to the Medcomp Research Foundation in Cincinnati, Ohio.

The project coordinator interviewed administrators, instructors, and students at these two training centers. A fourteen-page data collection form was used to record the data collected during these visits. The data collection forms were available to the steering committee members at the September 27th meeting. In addition, the project coordinator summarized key observations made during the visits. These observations were distributed to the steering committee members.

In early September, the project coordinator mailed a short questionnaire to local and state offices for the State Commission of the Blind and to the Governor's Coordinating Office for Visually Handicapped. This questionnaire requested the estimated number of prospective blind Texans who would be likely to pursue a career in computer programming. The state office for commission of the blind reported that there are ten blind Texans who have a vocational goal of computer programming.

The project director accumulated literature pertaining to special training devices used by blind programmers and/or blind programming students. Devices on which material was gathered included.

1. ARTS (Audio Response Time Sharing) System
2. Optacon
3. Audible Light Detector
4. Speech Plus (talking calculator)
5. Braille Display Terminal
6. Portable Braille Terminal
7. Triformation's LED-120 Braille Terminal
8. Triformation's LED-1 Brailling Device
9. Triformation's ISE-1 Braille Embosser
10. Triformation's BD-3 Braille Computer Terminal
11. Triformation's PBCE Reproduction System

The literature pertaining to the above devices was packaged and made available to the Steering Committee at the September 27th meeting.

The steering committee was notified of its' second meeting (scheduled from 9 a.m. to 4 p.m. on September 27) on September 8. Members and guests who participated in the September 27th meeting were: Barber, Davidson, Lindey, Marquardt, Musler, Raeke, Rice, Stehling, Thorogood, and Wiley. In addition the project coordinator's secretary (Hernandez) and four readers (Felan, Patterson, Ramos, and Wallace) attended the meeting. Each member and guest was presented a packet of summarized data (see attached). The committee was divided into small groups and, with assistance from the readers, all research material was reviewed before noon. After lunch, the committee discussed the results of the study at length. By a show of hands, the committee voted that (1) there were employment opportunities for blind/visually impaired computer programmers in Texas, (2) San Antonio College should provide a program to train blind visually impaired computer programmers, and (3) that the project move into Phase II.

This report covers the period of July 1, 1978 thru September 30, 1978. Only minor problems have been encountered and they have been resolved. These minor problems deal with approval of indirect costs and out-of-city travel. In addition, the amount of secretarial help was underestimated, and the personal interviews (in place of mail-out questionnaires to the employers) resulted in additional travel expense and time. The secretary is on a eleven-month contract and went out of town in August. Part-time assistance was employed to perform the secretarial duties in August. In September, the department experienced a 23% growth in enrollment, and additional part-time lecturers were employed. The increase in the secretary's work load did not allow her to spent 25% of her regular working hours on the project. Beginning in September, the secretary had to work on the project on an overtime basis.

With a few exceptions, the steering committee was not a "working committee." The persons invited to serve on the advisory committee to develop the program to train blind programmers (Phase II) are informed that it will be a "working committee", demanding much of their time as well as their expertise. Activities planned for Phase II are outlined in the proposal.

For additional information, please call or write the project coordinator.

Sincerely,

Al Stehling

Al Stehling

ATTACHMENT K

DATA PROCESSING SUBJECT OBJECTIVES

SUBJECT OBJECTIVES

Subject objectives for the following data processing courses were developed because:

(1) They are new courses or
(2) The existing course objectives did not meet the requirements for the program to train visually impaired computer programmers:

DP 402--Introduction to Electronic Data Processing and Programming

DP 202--BASIC Programming

DP 300--Specialized Data Entry Training

DP 302--Utilities and JCL

DP 316--COBOL Programming

DP 317--COBOL Programming

DP 307--File Processing

DP 313--Structured COBOL Programming

DP 304--System Analysis

DP 312--Advanced System Analysis and Design

DP 322--Data Processing Applications (Seminar)

DP 305--System/370 Assembly Language

DP 306--Advanced System/370 Assembly Language

DP 325--Teleprocessing Programming

DP 324--Programming Practicum

D. P. 402

Introduction to EDP and Programming

1. The student will define and differentiate between:
   - A. Digital and analog computers
   - B. Business and scientific applications
   - C. Real-time and batch processing
   - D. On-line and off-line processing
   - E. High-level and low-level languages
   - F. Source and object programs
   - G. Software and hardware
   - H. Primary, secondary, and auxiliary storage
   - I. Random and Sequential processing
   - J. Fields, records, and files
   - K. Bits, bytes, and "K"
   - L. Transaction and master files
   - M. Input editing and output editing
   - N. Multiprocessing and multiprogramming
   - O. I/O media and I/O devices
   - P. First, second, and third generation computers
2. The student will name, describe, and explain the relationships between:
   - A. Five elements of a computer system
   - B. Primary elements of the operating system
   - C. Various registers within the CPU

3. The student will describe the purpose and operations of the parity check.
4. The student will describe the common computer coding systems including:
   A. BCD (4 bits)
   B. Extended BCD (6 and 7 bits)
   C. EBCDIC (9 bits)
   D. ASCII
   E. Hollerith
5. The student will define and differentiate between:
   A. Numeric and alphabetic fields
   B. Signed and unsigned fields
   C. Low order and high order positions
   D. Packed and unpacked data
   E. Words, half-words, and double-words
   F. Random, sequential, and keyed files
   G. Timesharing and distributed processing
6. The student will define, differentiate, describe the advantages and necessities of using the following numbering systems: binary, octal, decimal, and hexadecimal.
7. The student will perform arithmetic operations and conversions in binary, octal, decimal, and hexadecimal.
8. The student will name and describe popular types of input and output. The student will identify advantages/disadvantages and name common uses for each type of input and/or output.

I/O media include punched cards, paper tape, magnetic tape, magnetic disks, keyboards, line printers, MICR, OCR, CRT, audio, COM, POS, plotters, and portable terminals.

9. The student will name and explain the parts of a computer instruction, the classifications of instructions, and parts of a program loop.
10. The student will define and differentiate between:
    A. System and program flowcharts
    B. Flowcharts and decision tables
    C. Programs and subroutines
    D. Conditional and unconditional branches
    E. Data and instruction names (labels, numbers)
    F. Storage address and address contents
    G. Assembler and compiler
    H. Debugging and program testing
    I. Milliseconds, microseconds, and nanoseconds
11. The student will explain the purpose and use of address modification.
12. The student will develop a pre-coding aid (flowchart, decision-table, etc.) to illustrate the program logic for a program with three control breaks plus run-out totals.
13. The student will develop a pre-coding aid (flowchart, decision-table, etc.) to illustrate the program logic to update a master disk file with punched card transactions (additions, deletions, and changes).

14. The student will define and discuss the advantages of documentation and structured programming.
15. The student will modify a flowchart prepared by the instructor.
16. The student will develop the logic (flowchart or other means) and illustrate the use of a closed subroutine that is used at least three times within the main program.
17. The student will develop input and output layouts.
18. The student will define and explain the advantages of mnemonic operation codes and symbolic addresses.
19. The student will define and give examples of macro instructions, and machine language instructions.
20. The student will describe and give examples of the following types of software: manufacture supplied, user developed, and utilities.
21. The student will identify coding statements from the popular programming languages such as COBOL, FORTRAN, and Assembly Language.

All of the above objectives are to be judged 90% correct and complete by the instructor.

D. P. 202

BASIC Programming

The student will demonstrate the ability to:

1. Log-on and Log-off on an on-line terminal, load a BASIC program previously written, modify the program, compile, and test the program with 95% accuracy.
2. Write a BASIC program to read and write to a disk file using information from both data statements and a stored array. Use the input statement to enter one or more responses. The program will be written, compiled, debugged, and tested within two weeks and judged 95% correct and complete by the instructor.
3. Write a BASIC program to include a loop utilitizing the "next" statement. The program will be written, compiled, debugged, and tested within one week and judged 95% correct and complete by the instructor.
4. Write a BASIC program to include the "IF - THEN, GO TO" statement. Accumulate totals for at least three control breaks plus the final totals. The program will be written, debugged, and tested within two weeks and judged 95% correct and complete by the instructor.
5. Write a BASIC program to utilize a sub-routine (use GOSUB and RETURN statements). The program will be written, debugged, and tested within two weeks and judged 95% correct and complete by the instructor.

D. P. 300

Specialized Data Entry Training

Prerequiste: Typing 35 WPM

The student will demonstrate the ability to:

1. Operate the card punch without assistance. Performance will be judged 90% correct by the instructor.
2. Punch and desk check source program cards with 95% accuracy.
3. Operate an on-line terminal without assistance. Performance will be judged 90% correct by the instructor.
4. Enter and desk check a source program on an on-line terminal with 95% accuracy.
5. In some way, verify the printed output from the data entry operations to insure that the data has been entered correctly. This input verification will be judged 95% correct by the instructor.

D. P. 302

Utilities and JCL

The student will demonstrate the ability to:

1. Use IEBCOPY to copy a 3-member partitioned data set excluding one member. The work is to be completed within 3 days and judged 95% correct by the instructor.
2. Run a three-step job to: (A) use SORT/MERGE to sort a sequential file on 2 keys, (B) use IEFBR14 to cause allocation and cataloging of a partitioned data set, and (C) use IEBGENER to create 2 members of the data set. Last record in member 'A' has 'END-of-1' and last record in 'B' has 'END-of-2', (D) use IEBGENER to print all the records with editing to (1) insert blanks between fields (2) insert a '$' in a specified column and (3) replace all blanks with '*' in a field. Delete (uncataloging) the data set. Work is to be completed within 2 weeks and judged 95% correct by the instructor.
3. Use IEBUPDTE to delete records positionally (ex. fifth thru tenth records from a sequential disk file, renumber sequence numbers, in bytes 73-80 of the remaining records). Sequence numbers will be in increments of 100. Work is to be completed within one week and judged 95% correct by the instructor.
4. Use IEHLIST to print a formatted VTOC listing. Work is to by completed within 2 days and judged 95% correct by the

instructor.

5. Use LINKAGE EDITOR to (a) store two sub-modules as members of a partitioned data set on disk and (b) execute the job consisting of the two sub-modules and a source deck of the main section. Work is to be completed within 2 weeks and judged 95% correct by the instructor.
6. Run a multi-step job to (a) use IEBCOMPR to determine whether corresponding members of two different partitioned data sets are the same and (b) if the records match, use IEBPTPCH to print records 6 thru 30 of one of the members. The member to be printed is to contain more than 30 records and the data set containing it is to be passed from the first step. Printing is to be conditioned on the return code from Step 1. Print no more than 30 lines per page. Work is to be completed within 2 weeks and judged 95% correct by the instructor.
7. (A) Write a PROCEDURE to be stored as a member of a partitioned data set. Use symbolic data set names in the procedure and pass the data sets. Use backward references in later steps. (B) Use the procedure supplying the data set names and add a condition parameter on one job step, delete a condition parameter on another step, change a block size and record length on one data set and change the disposition on one data set. Work is to be completed within 3 weeks and judged 95% correct by the instructor.

D. P. 316 and D. P. 317

COBOL Programming

The student will demonstrate the ability to:

1. Write a COBOL program to (A) edit random transactions and produce an error list, (B) sort the valid transactions using the COBOL sort feature, and (C) utilize the Report Writer feature to list the valid transactions.
   The input payroll file will include at least 100 records, each record containing at least six numeric fields and four alphabetic fields. Edit procedures will include range check, and batch control balancing.
   The valid transactions are to be sorted on at least two keys. Output procedures will include data compression on at least three alphabetic fields (for example: first name, middle name, last name). Printed output will include control breaks on the key fields.
   The program will be written, compiled, debugged, and tested within three weeks; and judged to be 95% correct and complete by the instructor.
2. Debug a COBOL program using the COBOL Debugging features. The student will locate 95% of the program errors within two days.
3. Write a "structured" COBOL program that is judged to be 90% efficient in the areas of (A) programming logic, (B) easy modification, (C) self-documentation, and (D) struc-

turing. The program is to be written, debugged, and tested within two weeks.

4. Modify a COBOL program written by another programmer. The student will complete the modification within two days and his modification will be judged 95% complete and correct by the instructor.

5. Write a COBOL program to build a table, match records, and perform a binary search. Three files will be used, (A) the customer master record, (B) the saving accounts transaction file, and (C) the control records file. The master and transaction file is in sequence by customer number and the control records file is in random sequence. Read the control records file and build a table by customer number. Match transaction and master files and locate the control information thru a binary search of the control table. The control table will supply the annual interest rate. Print a report including the customer number, the name and address from the master file, the savings amount from the transaction file, and the annual interest rate from the control table. The program will be written, compiled, and debugged within three weeks and judged to be 95% correct and complete by the instructor.

D. P. 307

File Processing

1. The student will describe the advantages and necessities for using various types of files (sequential, random, VSAM, ISAM, direct, and partitioned). The instructor will judge that the student's explantions are 90% correct and complete.
2. The student will explain the data base concepts to the instructor. The instructor will judge that the explanation is 90% correct and complete.
3. The student will differentiate between variable length and fixed length records. The instructor will judge that the explanation is 90% correct and complete.
4. The student will write a program to process variable length records (records will contain variable length fields). The program will be written, compiled, debugged, and tested within three weeks; and judged to be 95% correct and complete by the instructor.

D. P. 313

Structured COBOL Programming

1. Given a Visual Table of Contents, representing an information processing system, the student will prepare HIPO (Hierarchal Input Process Output) charts for that portion of the Visual Table of Contents which represents a program. The HIPO charts will be prepared within two weeks. The instructor will judge that the number of charts is 95% correct, and that the format and content is 90% correct.
2. The student will write a COBOL program following the HIPO charts. The program will conform to the following:
   a. Use 88 condition tests
   b. the procedure division will be in levels corresponding to the HIPO charts
   c. A routine will have only one entrance and one exit
   d. no GO TO verbs
   e. no compound IF statements
   f. use nested IF's in the "IF ... ELSE ..." format
   g. use indentation to pair the IF with its ELSE
   h. use structured periods

   The program will be written, compiled, debugged, and tested within one week and judged 95% correct and complete by the instructor.

D. P. 304 and D. P. 312

System Analysis

1. The student will design a small business subsystem that will demonstrate the students' ability to comprehend, analyze, and evaluate situations (problems) presented by the instructor, and synthesize these into logically sound solutions. The designed subsystem will include documentation in the form of system flowcharts and Hierarchical Input Process Output charts; classification of records; encoding of information; input and output layout designs; file and record designs; data controls; run controls; audit trails; and file organization. The designed subsystem will by judged 95% correct and complete by the instructor.

D. P. 322

Data Processing Applications

1. The student will participate (attendance, note-taking, and verbal communications) in 90% of the scheduled seminars.
2. The student will submit at least three topics for seminar meetings, assist in making the arrangements for at least one guest speaker, introduce one speaker or topic, and dictate at least one "thank you" letter to one of the seminar speakers. The students' performance will be judged 90% correct and effective by the instructor.
3. The student will develop a resume according to the format described by the instructor. The resume will be judged 90% correct and complete by the instructor.
4. The student will apply for a programmer trainee position at an off-campus computer installation. The student will make all necessary arrangements including the appointments and transportation, and apply for the position without assistance. The instructor will discuss the interview with the student and with the employer. The student will earn a 90% rating for his efforts as judged by the instructor.
5. The student will research a computer related topic and make a presentation at one of the scheduled seminars. The student's presentation will be judged 90% correct and complete by the instructor.

D. P. 305 and D. P. 306

System/370 Assembly Language

The student will demonstrate the ability to:

1. Write an Assembly Language program to (A) read a quarterly payroll file of at least 75 records by social security sequence, (B) accumulate the FICA field by department and grand total, (C) calculate the percent of the payroll cost represented by FICA, and (D) print an edit detail report including the department and grand FICA and percentage totals. The program will be written, assembled, and tested within two weeks and judged 95% complete and correct by the instructor.
2. Write an Assembly Language program to read a transaction file (of at least 75 records in random sequence) and build a table including the key field plus an amount field. Read a second transaction file in name sequence, perform a binary search to determine if the key field is located in the table. List the key field, name, and amount of matched records. Do not use utilities. The program is to be written, compiled, and debugged within three weeks and judged 95% correct and complete by the instructor.
3. Debug an Assembly Language "dump" provided by the instructor. Within a week, locate and correct programming

errors so the program will run to completion.

4. Write an Assembly Language program that includes the CALL macro and passing parameters to the CALLED subroutine which returns controls to the calling program. The program will be written, compiled, debugged and tested within two weeks; and judged 95% correct and complete by the instructor.

D. P. 325

Teleprocessing Programming

The student will write a COBOL or Assembler quasi-reentrant program to process transactions entered through a CRT and update a master file. The updated master file is to be printed. Mapping is to be done according to specifications in the problem assignment and will include: (A) at least one numeric field, (B) an alpha-numeric field, (C) a right-justified field, (D) a protected field, (E) a non-display (masked) field, and (F) a hi-lighted field; and will use assigned screen positions. CICS will be set up so that more than one transaction can be processed thru the student's program concurrently. The program will be written, compiled, debugged, and tested within three weeks; and judged to be 95% correct and complete by the instructor.

D. P. 324

Programming Practicum

Prerequisite: Successful completion of the Advanced COBOL course.

1. The student will write and/or modify computer programs in a production environment. This on-the-job assignment will preferably be off-campus. The student will achieve programming competence and productive skills equal to those achieved by sighted trainees as judged by the programming supervisor and the course instructor.
2. The student will arrange for transportation to and from the programming installation, and take whatever measures necessary to insure prompt and regular attendance. The student's attendance will be equivalent to the attendance standards established for the company's employees (as judged by the programming supervisor).

ATTACHMENT L

CURRICULUM AND CATALOG DESCRIPTIONS OF COURSES IN THE CURRICULUM

Proposed Curriculum
Associate Degree in Applied Science
Computer Programming for the Visually Impaired

Courses		Type *	Hours Credit	Contact Per Wk.	Est. H/W Per Week
Freshman Year, Fall Semester:					
DP	402 Introduction to EDP & Programming	S/M	4	4	12
DP	202 BASIC Programming	S/M	2	2	6
DP	300 Specialized Data Entry Training	S	3	6	0
ENG	601 English Composition	M	3	3	9
BT	317 Elementary Accounting	M	3	3	9
ORI.	101 Orientation to College	M	1	1	0
	Totals		16	19	36
Freshman Year, Spring Semester:					
DP	302 Utilities and JCL	S	3	6	15
DP	316 COBOL Programming	S	3	4	10
DP	307 File Processing	M	3	4	9
BT	314 Business Communication	M	3	3	9
TM	300 Technical Mathematics	M	3	3	6
	Totals		15	20	49

Courses		Type *	Hours Credit	Contact Per Wk.	Est. H/W Per Week
Sophomore Year, 1st Summer Semester:					
DP	313 Structured COBOL Programming	S	3	13**	19**
PHIL	312 Introduction to Logic	M	3	10**	19**
	Totals		6	23	38
Sophomore Year, 2nd Summer Semester:					
DP	304 System Analysis	M	3	10**	19**
DP	322 Data Processing Applications	S	3	10**	10**
	Totals		6	20	29
Sophomore Year, Fall Semester:					
DP	317 COBOL Programming Applications	M	3	4	12
DP	305 S/370 Assembly Language	M	3	4	12
DP	325 Teleprocessing Programming	S	3	4	12
DP	312 Adv. System Analysis & Design	S	3	3	12
	Totals		12	15	48

Courses		Type *	Hours Credit	Contact Per Wk.	Est. H/W Per Week
Sophomore Year, Spring Semester:					
DP	324 Programming Practicum	M	3	16	0
DP	306 Adv. S/370 Assembly Language	S	3	4	12
DP	321 Programming Applications (COBOL)	S	3	3	12
DP	322 Data Processing Applications	S	3	3	3
GOV	305 Texas Government***	M	3	3	3
	Totals		15	29	30
Degree Totals			70	126	N/A

* M = Mainstreamed
S = Segregated
S/M = Segregated if possible, mainstreamed otherwise

** Divide by 3.2 is course is taken during a long semester

*** Texas Government should be removed from the curriculum when it is no longer a college requirement for an Associate in Applied Science Degree.

CATALOG DESCRIPTIONS
of
Courses in Proposed Curriculum

Data Processing Courses: (Listed in the sequence as they appear in the curriculum).

1. DP 402 INTRODUCTION TO ELECTRONIC DATA PROCESSING AND PROGRAMMING
4 Semester Hours

Digital computer systems, input/output media and devices, primary and secondary storage, numbering systems, computer logic, program flowcharting, and an introduction to programming languages. Four lecture hours per week.

2. DP 202 BASIC PROGRAMMING 2 Semester Hours

Writing and debugging business and mathematical type problems in the Basic language. Entering programs via a CRT terminal or card reader on-line to the IBM System/370.

3. DP 300 SPECIALIZED DATA ENTRY TRAINING 3 Semester Hours

Conversion of source data into computer input media utilizing the card punch and specialized input devices. Three lecture hours and three laboratory hours per week.

4. DP 302 UTILITIES AND JCL 3 Semester Hours

Prerequisite: Data Processing 402. Utility programs, job control language, control of devices and resources, file and storage management, communications with the supervisor. Students write, test, and debug JCL procedures utilizing the IBM System/370. Three lecture hours and three laboratory hours per week.

5. DP 316 COBOL PROGRAMMING 3 Semester Hours

Prerequisite: Data Processing 402. American National Standard COBOL (Common Business Oriented Language.) Students write and debug programs using the COBOL verbs and their variations. Programs are compiled and tested on the IBM System/370. Three lecture hours and one laboratory hour per week.

6. DP 307 FILE PROCESSING 3 Semester Hours

Sequential, random, VSAM, ISAM, direct, and partitioned file processing techniques. Data base and variable length concepts. Students write, compile, test, and debug programs utilizing the IBM System/370. Three lecture hours and one laboratory hour per week.

7. DP 313 STRUCTURED COBOL PROGRAMMING 3 Semester Hours

Prerequisite: Data Processing 316. Structured program design based on Hierarchical Input Process Output charts. Students write, compile, test, and debug structured COBOL programs utilizing the IBM System/370. Three lecture hours and one laboratory hour per week.

8. DP 304 SYSTEM ANALYSIS 3 Semester Hours

Prerequisite: Data Processing 402. System investigation and design of computerized business applications. System flow charting; source documents; input and output forms design; types of computer runs; concurrent computer processing; types of files; and systems study through implementation. Three lecture hours per week.

9. DP 322 DATA PROCESSING APPLICATIONS 3 Semester Hours

Specialized training for Data Processing students and/or professionals. The subject of the course is announced prior to registration. May be repeated for credit when training varies.

10. DP 317 COBOL PROGRAMMING APPLICATIONS 3 Semester Hours

Prerequisite: Data Processing 316. Continuation of American National Standard COBOL Programming; more advanced techniques such as table handling, file sorting, report writing, and processing techniques for the various file organizations under the Operating System. Students write, compile, test, and debug programs utilizing the IBM System/370 computer. Three lecture hours and one laboratory hour per week.

11. DP 305 SYSTEM/370 ASSEMBLY LANGUAGE 3 Semester Hours

Prerequisite: Data Processing 402. Assembly Language, a review of the numbering systems; data formats; instruction formats; instruction sequencing and branching; interrupts; decimal and fixed-point instructions; and the use of registers. Writing, compiling, testing, and debugging programs utilizing the IBM System/370 computer. Three lecture hours and one laboratory hour per week.

12. DP 325 TELEPROCESSING PROGRAMMING 3 Semester Hours

Prerequisite: Data Processing 305 or 316. On-line programming techniques, CICS concepts, and basic mapping. Students write, test, and debug quasi-reentrant on-line programs utilizing the IBM System/370. Three lecture hours and one laboratory hour per week.

13. DP 312 ADVANCED SYSTEM ANALYSIS AND DESIGN
3 Semester Hours

Prerequisite: Data Processing 304. An advanced study of system design including system analysis, evaluation design, and documentation. Proper implementation and use of digital computer and accounting controls. The student designs a sub-system through the use of a case study. Three lecture hours per week.

14. DP 324 PROGRAMMING PRACTICUM 3 Semester Hours

Prerequisite: Grades of B or better in 3 of the following languages: RPG II, COBOL, FORTRAN, Assembly, or PL/1. Actual programming experience in a commercial installation. Student assignments may be off-campus. Fifteen hours per week of on-the-job training plus a one-hour weekly meeting.

15. DP 306 ADVANCED SYSTEM/370 ASSEMBLY LANGUAGE
3 Semester Hours

Prerequisite: Data Processing 305. A continuation of Assembly Language. Input/output techniques. Writing, compiling, testing and debugging programs utilizing the IBM System/370 computer. Three lecture hours and one laboratory hour per week.

16. DP 321 PROGRAMMING APPLICATIONS 3 Semester Hours

Prerequisite: Data Processing 312 and one of the following programming languages: COBOL, RPG II, Assembly Language, FORTRAN, or PL/1. The student designs a subsystem under the supervision of the instructor. The student writes and debugs the programs within the subsystem. Some of the projects assigned to students may require off-campus work. Primarily a laboratory course for training application programmers.

Support Courses: (Listed by department).

1. Business Technology 314 BUSINESS COMMUNICATIONS
3 Semester Hours

Practical psychology, good business judgement, and clear, forceful English in writing business letters.

2. Business Technology 317 ELEMENTARY ACCOUNTING
3 Semester Hours

Record keeping and accounting procedures used business. Practice in entering daily transactions, using standard accounting records and preparing financial statements.

3. English 601a ENGLISH COMPOSITION 3 Semester Hours

A study of the principles of correct and effective oral and written Standard English expression. Much practice in reading and writing of prose, chiefly expository.

4. Government 305 AMERICAN GOVERNMENT 3 Semester Hours

Comparison of the Texas and U.S. Constitutions, federalism, citizenship, voting, and local government.

5. Orientation 101 ORIENTATION TO COLLEGE 1 Semester Hour

The new student adjusting to the college - its staff, facilities, services, policies, and procedures; motivation academically; the get-acquainted process; stimulate continued personal growth. Three lecture hours per week; sixteen total contact hours. Required of Day Division students enrolled for nine or more semester hours.

6. Philosophy 312 INTRODUCTION TO LOGIC 3 Semester Hours

An examination of the laws of deductive and inductive reasoning and their application to various fields of investigation.

7. Technical Math. 300 TECHNICAL MATHEMATICS I
3 Semester Hours

Practical applied mathematics for engineering shop, construction site, design and drafting rooms. Arithmetic fundamentals, basic algebra, geometry, and metrication, development of "number sense" and employment of the electronic calculator.

ATTACHMENT M

ENTRY LEVEL CRITERIA

Entry Level Criteria

For

Students Applying for Admission for

Training for Visually Impaired Computer Programmers

A selection committee of at least four persons (including a visually impaired programmer, an employer, and the program director) will screen the prospective students. Screening will include (1) a personal interview that will be tailored to the individual applicant and (2) an evaluation of an autobiography prepared by the student.

The purpose of the selection committee's activities is to insure that only qualified students enter the strenuous training program. Students recommended for acceptance should have the qualifications to complete the program, and to gain and to retain employment as computer programmers. In evaluating the student, the committee will have the flexibility to consider other abilities and aptitudes that would supplement or replace the criteria listed below:

1. Meet college admission requirements.

2. Test score(s) of: SAT: Eng. 14 and Math. 18

   OR

   ACT: Eng. 380 and Math. 390

   OR

   IQ : 120

3. Qualifications for enrollment into the freshmen English composition course.

4. Ability to perform basic arithmetic operations.

5. Good school grades.

6. 20 WPM typing speed with a high degree of accuracy.

7. Ability to read 100 WPM and write 12 WPM in braille or print.

8. Successful completion of "independent living skills" training.

9. Acceptable keys on an "interest inventory".

10. Good mobility.

11. Good grooming.

12. Strong desire to be independent.

13. High level of motivation.

14. Good general health.

15. Ability to cope with the frustrations normally associated with programming tasks.

16. Strong desire to gain employment in the programming profession.

ATTACHMENT N

SPECIAL DEVICES AND EQUIPMENT

Special Devices and Equipment

List below are the recommended special devices and equipment requirements to train twelve visually impaired computer programmers. Although brand names are given in some cases, similar devices may be purchased or leased from a competitive manufacturer.

Special Devices:

Three (3) IBM 3278 CRTs

Three (3) Optacons

One (1) LED-30 Braille Terminal

One (1) IBM 029 Card Punch

One (1) Visual-Tek

Equipment:

One (1) Magnifying Lens (for CRT)

Three (3) Tape Recorders

Two (2) Perkins Brailler

One (1) Paperless Brailler

ATTACHMENT O

NEWSPAPER ARTICLES

S.A.C. will offer computer class for blind

San Antonio College will offer the first training in Texas for visually impaired computer programmers under a new program being developed to begin August 1979.

Al Stehling, data processing department chairman and project coordinator, says this training will not be for the average blind person.

"It will probably be a state-wide program for high achievers. A person will need a lot of motivation to get into the program. There will probably be a selection committee to insure those who begin the program can complete it."

To be accepted for this specialized computer programmer training, Stehling says a visually impaired person will need to be highly motivated, intellectually gifted and have completed a rehabilitation program to be able to get from class to class.

The decision to develop this program was preceded by three months of fact-gathering under a two-phase feasibility study funded by the Texas Education Agency.

Under Phase I of the project, conducted July 1 to Sept. 31, a steering committee surveyed employment opportunities and training requirements. The committee concluded that a need exists for computer programmer training for the visually impaired in Texas.

Represented on the steering committee were the Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employers of visually impaired programmers (City Water Board and Frost National Bank), Texas Education Agency, local blind programmers and San Antonio College.

The Texas Education Agency is anxious for SAC's program to begin because the state now sends visually impaired Texans to Cincinnti for programmer training.

Stehling said the requirements for blind programmers will differ somewhat from those for sighted persons.

"The committee agreed that a blind programmer needs to be better trained thanb a sighted programmer, but in fewer areas."

The Phase I survey data revealed it takes a blind person longer to prepare a computer program, but he makes fewer mistakes, so he does less debugging and error correction and, therefore, can put a computer program into operation as soon as a sighted person.

Stehling says there is strong agreement that the blind, through necessity, have to organize their thoughts and daily lives in logical sequence.

"That's what a computer programmer does — organize and put everything in systematic sequence."

Stehling explained that a sighted programmer uses a flow chart to graphically present the program sequence.

"The visually impaired write the program in large letters on large paper. A blind programmer relies on his memory. He works out the program sequence in his mind."

He said blind programmers use two devices to present the program sequence. They either type it or key punch it directly into the computer.

To develop the specialized curriculum, Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October.

Committee members are Don Douglas and Chester eley of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of San Antonio College, Jimmy R. Sparkman of Tesoro Petroleum Corporation and Bob Wiley of City Water Board.

Stehling says the committee plans to get a two-year curriculum in final form before Christmas.

"In January we will develop the course syllabus. To obtain funds to implement the program, we will present the package to state and federal agencies.

"We expect the initial training program, proposed for fall 1979, will be small — about 12 students."

SAN ANTONIO EXPRESS—Monday, Dec. 18, 1978

SAC debuts new course

Texas' first training program for visually impaired computer programmers will debut at San Antonio College in August.

According to Al Stehling, data processing department chairman and project coordinator, the program "probably will be a statewide program for high achievers. There probably will be a selection committee to insure those who begin the program can complete it."

The Texas Education Agency is especially eager for the program to begin because currently, the state sends visually impaired Tex to Cincinnati for programmer training.

Decision to develop the program was preceeded by three months of fact gathering under a two year feasibility study funded by the Texas Education Agency.

A steering committee surveyed employment opportunities and training requirements and concluded a need exists for computer programmer training for the blind in Texas.

Stehling said only visually impaired persons who are highly motivated, intellectually gifted, and who have completed a rehabilitation program will be accepted into the program.

Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October. They are helping him develop the specialized curriculum.

They plan to submit a two year curriculum before Christmas, develop a course syllabus in January and present the proposal to state and federal agencies to obtain funds to implement the program, Stehling said.

THE SAN ANTONIO LIGHT

Saturday, Dec. 23, 1978

Bexar Today

TRAINING. San Antonio College will offer the first training program in Texas for visually impaired computer programmers. The new program will begin in August 1979. To participate in the program, a visually impaired person must be highly motivated, intellectually gifted and have completed a rehabilitation program to be able to get from class to class, said Al Stehling, data processing department chairman.

SAC making plans to offer computer training for blind

San Antonio College will offer the first training in Texas for visually impaired computer programmers under a new program being developed to begin August, 1979.

Al Stehling, data processing department chairman and project coordinator, says this training will not be for the average blind person.

"It will probably be a state wide program for high achievers. A person will need a lot of motivation to get into the program. There will probably be a selection committee to insure those who begin the program can complete it."

To be accepted for this specialized computer programmer training, Stehling says a visually impaired person will need to be highly motivated, intellectually gifted and have completed a rehabilitation program to be able to get from class to class.

The decision to develop this program was preceded by three months of fact-gathering under a two-phase feasibility study funded by the Texas Education Agency.

Under Phase I of the project, conducted July 1 to Sept. 31, a steering committee surveyed employment opportunities and training requirements.

The committee concluded that a need exists for computer programmer training for the visually impaired in Texas.

Represented on the steering committee were the Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employers of visually impaired programmers (City Water Board and Frost National Bank), Texas Education Agency, local blind programmers and San Antonio College.

The Texas Education Agency is anxious for SAC's program to begin because the state now sends visually impaired Texans to Cincinnati for programmer training.

Stehling said the requirements for blind programmers will differ somewhat from those for sighted persons.

"The committee agreed that a blind programmer needs to be better trained than a sighted programmer, but in fewer areas."

The Phase I survey date revealed it takes a blind person longer to prepare a computer program, but he makes few mistakes, so he does less debugging and error correction and, therefore, can put a computer program into operation as soon as a sighted person.

Stehling says there is strong agreement that the blind, through necessity, have to organize their thoughts and daily lives in logical sequence.

"That's what a computer programmer does--organize and put everything in systematic sequence."

Stehling explained that a sighted programmer uses a flow chart to graphically present the program sequence.

"The visually impaired write the program in large letters on large paper. A blind programmer relies on his memory. He works out the program sequence in his mind."

He said blind programmers use two devices to present the program sequence. They either type it or key punch it directly into the computer.

To develop the specialized curriculum, Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October.

Committee members are Don Douglas and Chester Neeley of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of San Antonio College, Jimmy R. Sparkman of Tesoro Petroleum Corporation and Bob Wiley of City Water Board.

"In January we will develop the course syllabus. To obtain funds to implement the program, we will present the package to state and federal agencies.

"We expect the initial training program, proposed for fall 1979, will be small--about 12 students."

Program to begin in fall

Computer course helps blind

The first training in Texas under a new program developed for visually-impaired computer programers may begin here in August.

"This training will be for above-average blind persons. It will be a statewide program for high achievers," Al Stehling, data processing department chairman and project coordinator, said.

Stehling said a person will need a high motivation to get into the program. A selection committee will insure those who begin the program can complete it.

"To be accepted for this specialized computer programer training, a visually-impaired person will need to be highly motivated and intellectually gifted and have completed a rehabilitation program," Stehling said.

The decision to develop this program was preceded by three months of fact-gathering under a two-phase feasibility study funded by the Texas Education Agency (TEA).

Under Phase I, conducted July 1 -Sept. 30, a steering committee surveyed employment opportunities and training requirements. A 13-member committee concluded a need exists for computer programer training for the visually impaired in Texas.

Represented on the steering committee with this college were Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employers of visually-impaired programers at City Water Board and Frost National Bank, TEA and other blind programers.

"Texas Commission for the Blind is anxious for the program to begin here because the state sends visually-impaired Texans out of state for programer training," Stehling said.

He said entry level requirements for blind programers will be higher than for sighted persons.

"The committee agreed that a blind programer needs to be better trained than a sighted programer, but in fewer areas. The proposed curriculum will cover fewer programing languages, but will move toward more advanced studies," Stehling said.

He explained the Phase I survey data revealed it takes a blind person longer to prepare a computer program, but he makes fewer mistakes. So he does less debugging and error correction and, therefore, can place a computer program into production as quickly as a sighted programer.

Stehling said committee members concluded the blind organize their thoughts and daily lives in logical sequence.

"That's what a computer programer does — organizes and places everything in systematic sequence," he observed.

He said some visually-impaired persons write the program in large letters on large paper. Blind programers use two devices to present the program sequence. They either key punch or key it directly into the computer.

To develop the specialized curriculum, Stehling has worked with an advisory committee of blind and sighted programers since mid-October.

Committee members are Don Douglas of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of data processing, Jimmy R. Sparkman of Tesoro Petroleum Corp., and Bob Wiley a blind employee of City Water Board.

Stehling said the committee will prepare a two-year curriculum before Wednesday and submit it to TEA.

"Additional funding will be requested for a pilot project to implement the two-year associate degree program," Stehling said.

"Ideally, that pilot study should begin June 1 to allow time to hire a qualified program director and to make arrangements to lease special training devices," Stehling pointed out. "However, if the project is approved, funding will not be available until July 1."

Stehling said committee members are optimistic. They have received verbal support and encouragement from Texas Commission for the Blind.

Stehling and the department will update the curriculum for the associate degree in computer programming and computer operation to add new courses for sighted persons.

"We expect to limit the initial training program proposed for fall to 12 students," Stehling said.

173

174

Advisory board approves computer program

A program to train visually-impaired computer programers here in the fall is a step closer to realization.

Development of a curriculum for a two-year program was completed recently by a seven-member advisory committee.

Al Stehling, data processing department chairman and project coordinator, said the proposed curriculum was submitted to the Texas Education Agency for its consideration early this month.

He said the next step will be to submit next month to TEA a proposal for a project to implement a two-year program to train blind computer programers.

"If TEA approves this pilot project, the program will go into effect July 1," Stehling said.

He said TEA officials are encouraging.

"They seem very optimistic and very pleased with the results of the study and encouraged us to continue with the program," he said.

Stehling said the curriculum was designed to allow the program director to alter it to suit the employment opportunities for a particular student.

"The program will be geared at employability, rather than transferability," he said.

Some of the courses also will be offered to sighted students.

"These courses, however, will be indentified as mainstreamed," Stehling said. "And courses designed for unsighted students will be identified as segregated."

Stehling said unsighted students will register for mainstreamed courses with sighted students.

"Sighted students may register for segregated courses only after they are fully aware that the class presentations are geared toward unsighted students. Traditional training aids will not be utilized," he said.

Stehling said the committee also agreed that in some cases, courses identified as mainstreamed could be segregated when the number of blind students justified a separate class.

The new program will require three full-time employees — a program director, a faculty member to be shared with the data processing department and a clerk typist.

The program will require also one additional classroom/laboratory.

"This room should house the special training devices and should serve as an open laboratory for the unsighted students whenever segregated classes are not scheduled in the room," Stehling said.

Stehling said the committee agreed students would be next if the director or faculty member were visually impaired.

"To begin the program in the fall, the three staff members should be in place June 1," Stehling said.

"Since this would be a unique program in Texas, out-of-state students would be attracted also," Stehling said.

175

176

ATTACHMENT P

SECOND QUARTERLY REPORT

SAN ANTONIO COLLEGE 1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

February 6, 1979

TO: Ray Barber, Director, Exemplary and Innovative Programs, TEA

FROM: Al Stehling, Project Coordinator

SUBJECT: Quarterly Progress Report: Feasibility Study and Development of a Program to Train Visually Impaired Students in Computer Programming

Phase I was completed on schedule, and results of the feasibility study were reported on the quarterly report dated 10-5-78.

The following persons were invited to serve on the advisory committee to develop the program to train blind and visually impaired computer programmers. All committee members, except Chester Neeley, were active:

1. Donald Douglas
   Vice-President, Data Processing
   Frost National Bank

2. John P. Merritt
   Assistant Data Processing Manager
   San Antonio Light

3. Chester Neeley, (blind)
   Automation Officer, System Research
   Frost National Bank

4. Anette Ratcliffe
   Data Processing Laboratory Technician
   San Antonio College

5. Jimmy R. Sparkman
   Programmer Analyst
   Tesoro Petroleum Corp.

6. Bob Wiley (blind)
   Programmer/Procedures Analyst
   City Water Board

7. Al Stehling (project coordinator)
   Chairman, Data Processing Department
   San Antonio College

The first advisory committee meeting was held on Oct. 18, 1978 in room 208 of the Nail Technical Center. Subsequent meetings were held on Oct. 25, Nov. 1, Nov. 8, Nov. 15, Nov. 22, Nov. 29, Dec. 13, and on Jan. 10, 1979. A final meeting was held on Jan. 29 to allow committee members to review the proposed quarterly report.

During the first advisory committee meeting, members were informed of the seven activities to be included in Phase II (curriculum development). Committee members were briefed on the objectives and the progress of the project, and were given materials to familiarize themselves with the projects effort up to that point. Materials included the Phase I Progress Report, comparison of curricula of four schools that train blind programmers, and a listing of the Phase II activities. In addition, material packets pertaining to special devices and schools that train blind programmers were made available to committee members on a sign-out basis.

Early in Phase II, committee members agreed that: (1) rehabilitation training must be completed before the students qualify for computer programming training, (2) the curriculum must be flexible in the sense that the program director can alter the curriculum to suit the employment opportunities for a particular student, (3) an associate degree program would offer the best employment opportunities, (4) the students should be offered more advanced programming techniques and studies, but in fewer areas (as compared to the current AAS programs in computer programming), and (5) the program would be designed for employability, not transferability.

Beginning at the very first meeting, the committee members developed a list of "subjects" to be included in the program. Each proposed "subject" was justified by one or more members and discussed in detail. During the next few weeks, subject areas were modified, added, and, in some cases, deleted or combined. Objectives were written for each "subject". These objectives were also discussed in great detail and most subject objectives were re-written three or four times. "Subjects" were then translated into courses. Some subjects can be taught as one course, other subjects will have to be covered in two courses (example: the COBOL programming subject objectives are reached after the student completes the second COBOL course).

Committee members reviewed existing course syllabuses to determine which existing courses (offered by the data processing and supporting departments) would fulfill the stated subject objectives. A memo was sent to those departments that appeared to offer the required

support courses to double-check the departments' willingness to mainstream the blind/visually impaired students into their classes.

Only one department indicated that it could not accommodate blind students. The committee found a similar course offered by another department and modified the curriculum accordingly.

A proposed 16-month curriculum was prepared and studied in detail. The proposed curriculum was redesigned and extended to a 21-month AAS program. Support courses (non-data processing courses) were selected on the merits of their contents rather than transferability.

Next the committee, with much input from a blind programmer, estimated the number of weekly study/home-work hours for each course in the curriculum. Then the courses were classified as "segregated" or "mainstreamed". For the purpose of this project, mainstreamed means that the unsighted students will register for that course along with the sighted students. Segregated classes are special classes for the unsighted students. Sighted students may register for segregated classes, but only after they are fully aware that (1) the class presentations are geared towards unsighted students and (2) that traditional training aids will not be utilized. In addition, the committee agreed that in some cases, courses identified as "mainstreamed" could be segregated---if the number of unsighted students justified a separate class.

During the next few weeks the curriculum was modified and adjusted to: (1) strengthen the program and (2) agree with the college's requirements for an AAS degree. In late November, the Dean informed the project director that new courses would have to be listed in the catalog before they could be taught. The project director drafted proposed catalog descriptions for the new "first year" courses. The committee reviewed and modified the course descriptions, and the new course descriptions were presented to the Director of OET in time for presentation to the December 1978, Academic Council meeting. Since the final decision to offer a special curriculum to train blind programmers had not been made, the catalog descriptions were written without reference to the blind or visually impaired. New courses included in the "second year" of the curriculum will be added to the catalog in 1980.

Modifications to the proposed curriculum were continuous as the program was streamlined. Subject objectives, course titles, course descriptions, and course numbers were changed as committee members proposed adjustments to strengthen the program. Whenever possible,

existing courses were used to avoid duplication and to reduce the demand for new catalog courses. The current catalog description for DP 322---Data Processing Applications was changed so that the proposed seminars for the visually impaired could be offered under that existing course number.

The project director gathered information pertaining to existing services for the visually impaired students from the college's Special Service Division and the Coordinator for the Handicapped. In addition, the director gathered data from local and state representatives of the State Commission of the Blind. Job placement service information was gathered from the college's placement director and the local representative of the State Commission of the Blind. Based on the counseling, tutoring, and job placement services already available to unsighted students, the committee saw no need for additional studies in these areas. All of the divisions and organizations contacted foresaw no problems in handling 10 to 15 additional unsighted students.

As the committee's studies progressed, it became easier to determine the ideal number of unsighted students to be placed into the program. The final recommendation is to start 12 students in the Fall, 1979 semester.

At this stage, the committee feels that the visually impaired can best be trained by serving one group at a time. Therefore, it is suggested that the second group of visually impaired students start in the Fall of 1981. The reason for proposing a "consecutive" program (working with a group of students to completion before starting the next group) rather than a "concurrent" program (starting a few more students every semester) is to avoid the need for many very small segregated classes. A large number of small classes would cause instructors load and classroom/lab scheduling problems.

The committee realizes that exceptions to the above "consecutive" approach can still be made because: (1) the program director can make an exception based on the merits of a particular student's educational and/or job experience background and (2) student's who meet the college's entrance requirements and course prerequisites can enroll in D.P. classes following the established registration procedures.

The entry level standards established by other schools that train blind programmers were studied. Slowly the entry level criteria to be used by the selection committee were developed. Each criterion

was discussed in detail and most were modified several times. Bearing in mind that the original assignment was to develop a program to train the "intelligent" blind, the final criteria are meant to be strict enough to insure that selected students can master the subjects, gain employment, and retain employment as computer programmers.

Prospective students are to be screened by a selection committee composed of at least four persons including the program director, a visually impaired computer programmer, and an employer. The selection committee will have the flexibility to consider other abilities and aptitudes that would supplement or replace the established criteria.

After reviewing literature pertaining to (1) training devices for blind programming students and (2) training devices used by other schools for visually impaired computer programmers, the committee selected the devices which would provide maximum training effectiveness. An area of much concern and discussion centered on the type of devices available to the unsighted programmers after employment. Very few employers have braille output devices and virtually none have braille terminals. The majority of the committee members felt that the devices and equipment used during the training period should be selected on their merits of providing maximum training effectiveness and not only the probability of their use after employment. In addition, employers are more apt to purchase braille terminals if the unsighted programmers have mastered their operation and can vouch for their usefulness.

The training program would require three 12-month employees; namely, a program director, a faculty member (who would be shared by the data processing department), and a clerk-typist. Office space and furniture would be required to house the three persons.

One additional classroom/lab would be required. This room would house the special training devices and would serve as an open lab for the unsighted students whenever segregated classes were not scheduled in the room. Assisting the director would be the instructor, one student assistant (a second-year data processing major), and student tutors.

The qualifications for the director and the faculty member were outlined. The committee agreed that it would be to the students' advantage if the director or faculty member were visually impaired. The director and the faculty who teach the visually impaired need specialized training (in-house or off-campus) in the areas of teaching techniques and counseling.

During Phase II, public relations efforts resulted in news releases in the San Antonio's daily and weekly newspapers, and the college's newspaper. Unsighted Texans are hearing about the project's studies as evidenced by long distance telephone calls from prospective students and interested organizations.

The advisory committee feels that the attached curriculum will provide unsighted students the skills required to seek employment as entry-level computer programmers. Although the subject objectives and the curriculum have been developed, many details need to be completed before the program can be placed into operation. Selecting text books, leasing of special devices and equipment, locating offices and classroom/lab space, establishing a screening committee, screening the prospective students, converting text materials into braille and "talking books", writing and redesigning of detailed course sylabuses, etc., are some of the tasks that will require a great deal of attention. In view of the amount of time that it takes to accomplish these tasks through the proper channels, the personnel should be hired at least three months before the program begins. The program staff will have to communicate and work closely with the various agencies and organizations that serve visually impaired Texans so that prospective students can be made aware of the program. Out-of-state students will also be attracted to the program since it will be unique for the Southern states. In order to begin the program in the Fall 1979 Semester, the program director, the faculty member, and the clerk-typist should be employed no later than June 1, 1979.

Since there are many variables (some of them yet unknown) that could effect the cost and operations of the training program, the committee agreed that a good approach would be to apply for state funds for a two-year pilot program to train 12 unsighted students. During this period the program would be modified to strengthen the training process, and the costs per student would be calculated. Beginning with the third year, a vocational training fee could be charged to offset the difference between the contact-hour revenue and the actual costs to train a blind/visually impaired computer programmer.

This report covers the period of October 1, 1978 thru January 31, 1979. Minor problems were encountered and action was taken to resolve them. One problem dealt with charges to the project's budget. Although the project's account number was used on all orders and requisitions, most expenditures were charged to the Data Processing Department. The project coordinator met with the district's Director of Finance and adjustments were made to route the charges into the proper budget accounts.

A disappointing aspect of the study was that agencies and organizations hedged when asked what specific services and financial support that they could contribute to the program and/or the students. Most agencies and organizations were friendly and cooperative, although they appeared to be more willing to outline what others could do, rather than to commit themselves.

The Advisory Committee for Phase II was an active "working committee". In addition to attending the meetings, committee members faithfully reviewed the many handouts developed by the project coordinator, and in some cases researched materials pertaining to devices and course contents on their own. The committee members were dedicated to the project and are anxious for the program to materialize.

For additional information, please call or write the project coordinator.

Al Stebling

Attachments: Subject Objectives
Proposed Curriculum
Entry Level Criteria
Special Devices and Equipment
Personnel Qualifications

Subject Objectives

Subject objectives for the following courses were developed because:

(1) they are new courses or
(2) the existing course objectives did not meet the requirements for the program to train visually impaired computer programmers:

1. DP 402--Introduction to Electronic Data Processing and Programming
2. DP 202--BASIC Programming
3. DP 300--Specialized Data Entry Training
4. DP 302--Utilities and JCL
5. DP 316--COBOL Programming
6. DP 317--COBOL Programming Applications
7. DP 307--File Processing
8. DP 313--Structured COBOL Programming
9. DP 304--System Analysis
10. DP 312--Advanced System Analysis and Design
11. DP 322--Data Processing Applications (seminar)
12. DP 305--System/370 Assembly Language
13. DP 306--Advanced System/370 Assembly Language
14. DP 325--Teleprocessing Programming
15. DP 324--Programming Practicum

Notes: DP 402 and DP 202 will be taught as a "block" which means that the two courses will be combined and taught as one large six-hour course. This allows the student to master computer concepts before moving on to the BASIC programming language.

The COBOL programming subject objectives cover two courses, namely DP 316 and DP 317.

The system design objectives cover two courses, namely DP 304 and DP 312.

The System/370 Assembly Language objectives cover two courses, namely DP 305 and DP 306.

DP 322 (seminar) is offered twice in the curriculum. The objectives will be identified in the seminar title.

Existing course objectives meet the requirements for the remaining classes in the curriculum.

Attachment II

Proposed Curriculum

Associate Degree in Applied Science

Computer Programming for the Visually Impaired

Courses		Type *	Hours Credit	Contact Per Wk.	Est. H/W Per Week
Freshman Year, Fall Semester:					
DP 402	Intro. to EDP & Programming	Block S/M	4	4	12
DP 202	BASIC Programming	S/M	2	2	6
DP 300	Specialized Data Entry Training	S	3	6	0
ENG 601	English Composition	M	3	3	9
BT 317	Elementary Accounting	M	3	3	9
ORI. 101	Orientation to College	M	1	1	0
	Totals		16	19	36
Freshman Year, Spring Semester:					
DP 302	Utilities and JCL	S	3	6	15
DP 316	COBOL Programming	S	3	4	10
DP 307	File Processing	M	3	4	9
BT 314	Business Communication	M	3	3	9
MT 300	Technical Mathematics	M	3	3	6
	Totals		15	20	49
Sophomore Year, 1st Summer Semester:					
DP 313	Structured COBOL Programming	S	3	13**	19**
PHIL 312	Introduction to Logic	M	3	10**	19**
	Totals		6	23	38

Courses		Type*	Hours Cr.	Contact	H/W
Sophomore Year, 2nd Summer Semester:					
DP	304 System Analysis	M	3	10**	19**
DP	322 Data Processing Applications	S	3	10**	10**
	Totals		6	20	29
Sophomore Year, Fall Semester:					
DP	317 COBOL Programming Applications	M	3	4	12
DP	305 S/370 Assembly Language	M	3	4	12
DP	325 Teleprocessing Programming	S	3	4	12
DP	312 Adv. System Analysis & Design	S	3	3	12
	Totals		12	15	48
Sophomore Year, Spring Semester:					
DP	324 Programming Practicum	M	3	16	0
DP	306 Adv. S/370 Assembly Language	S	3	4	12
DP	321 Programming Applications (COBOL)	S	3	3	12
DP	322 Data Processing Applications	S	3	3	3
GOV	305 Texas Government***	M	3	3	3
	Totals		15	29	30
Degree Totals			70	126	N/A

* M = Mainstreamed
S = Segregated
S/M = Segregated if possible, mainstreamed otherwise

** Divide by 3.2 if course is taken during a long semester

*** Texas Government should be removed from the curriculum when it is no longer a college requirement for an Associate in Applied Science Degree.

Attachment III

Entry Level Criteria for Students Applying for Admission for Training for Visually Impaired Computer Programmers

A selection committee of at least four persons (including a visually impaired programmer, an employer, and the program director) will screen the prospective students. Screening will include (1) a personal interview that will be tailored to the individual applicant and (2) an evaluation of an autobiography prepared by the student.

The purpose of the selection committee's activities is to insure that only qualified students enter the strenuous training program. Students recommended for acceptance should have the qualifications to complete the program, and to gain and to retain employment as computer programmers. In evaluating the student, the committee will have the flexibility to consider other abilities and aptitudes that would supplement or replace the criteria listed below:

1. Meet college admission requirements.
2. Test score(s) of: SAT: Eng. 14 and Math. 18

   OR

   ACT: Eng. 380 and Math. 390

   OR

   IQ : 120
3. Qualifications for enrollment into the freshmen English composition course.
4. Ability to perform basic arithmetic operations.
5. Good school grades.
6. 20 WPM typing speed with a high degree of accuracy.
7. Ability to read 100 WPM and write 12 WPM in braille or print.
8. Successful completion of "independent living skills" training.
9. Acceptable keys on an "interest inventory".
10. Good mobility.

Special Devices and Equipment

The advisory committee recommends that the following special devices and equipment be purchased or leased in order to train twelve blind/visually impaired computer programmers.

Special Devices:

	Estimated Costs Per Unit	Extended Cost
Three (3) IBM 3278 CRTs	$ 2,400	$ 7,200
Three (3) Optacons	3,000	9,000
One (1) LED-30 (on-line braille terminal)	9,500	9,500
One (1) IBM 029 Card Punch	2,100	2,100
One (1) Visual-Tek	2,000	2,000
Special Equipment:		
One (1) magnifying lens for CRT unit	40	40
Three (3) tape recorders	50	150
Two (2) Perkins Braillers	150	300
Optional Equipment:		
One (1) paperless brailler (this piece of equipment has been announced, but has not been placed on the market)	2,400	2,400

Notes: (1) Due to inflation, a 10% increase in price should be expected every year. (2) Delivery schedules and new products announcements may prompt the program director to purchase or lease similar devices in lieu of the devices and equipment listed above.

Personnel Qualifications

In addition to meeting the established TEA and college employment qualifications, program personnel should have these additional qualifications:

Program Director:

1. Experience in computer programming (preferrably COBOL, JCL, and Assembly Language)

2. Administrative experience

3. Schooling in the areas of education and/or counseling.

Instructor:

1. Experience in COBOL, JCL, and Assembly Language programming.

Note: It would be to the students' advantage if the program director or the instructor was visually impaired.

"END OF DOCUMENT"